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This Week in The IRON AGE

Vol. 156, No. 7 August 16, 1945

Editorial

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Technical Articles

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Features

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News and Markets

o o o

Massive pieces, like this Gear Case Section, exemplify the ability of Mahon to handle any size or type of welded steel plate fabrication for any purpose.

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The
IRON AGE

ESTABLISHED 1855

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August 16, 1945

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Peace—It's Wonderful

"PEACE—it's wonderful." Such is the slogan of Father Divine and on the basis of it he manages to dish out the chicken to his followers.

Perhaps that thought was in the mind of Senator Vandenberg in proposing an American industrial peace parley. Certainly internecine warfare does not put chicken on the table, money in the till or cash in the pay envelope.

War never won anybody anything except a headache. We are going to find that out in connection with the defeat of Germany and the shortly coming victory over Japan. This last war, I will admit, seemed unavoidable, but it might not have been unavoidable if we had developed some other way of adjusting differences. And supposing that we had, how far ahead and how much better off would all of us be today, both victors and vanquished!

The United Nations Conference at San Francisco will not solve the problem of peace between nations but it is a start in that direction. It got people together. So did the Potsdam meeting. Getting together and knowing each other is the first step in the necessary many that must take place before any complicated structure, physical, political or economic, can be erected.

Labor is here in America to stay. And so, I hope, for the sake of labor is management. They are not interchangeable. And necessary to both and to the future of the public is capital. Not the capital that is spelled with a capital "C" but that which is represented by the savings of the millions of ordinary people, such as ourselves, which indeed today are the principal source of investment in new and in going enterprise.

So I am glad that Senator Vandenberg has made his suggestion for an employer-employee peace table. No matter who settles the bill for the lunch on that occasion, and perhaps it will be Uncle Sam, whatever it costs will be worth a lot more than millions that might be spent or lost in strikes and shutdowns. We are going to need every ounce of constructive effort to give our people what they need and what they want to make up for the deprivations of war, and every hour and day lost from now on by unnecessary conflict is simply another nail in our mutual economic coffin.

I am glad that our new Secretary of Labor, Mr. Schwellenbach, Eric Johnston, president of the U. S. Chamber of Commerce, Ira Mosher, president of the National Association of Manufacturers and William Green, president of the AFL, have already expressed approval of this plan in writing. Philip Murray has long been on record with Eric Johnston as advocating such a plan.

Under such auspices, it should get off to a good start. And a start is all that anyone can expect in any fundamental movement, be it international or domestic.

Provided these representative gentlemen can agree upon certain fundamentals of plan and procedure, as well as objectives, I believe that the great majority of us ordinary citizens will fall in line behind them.

Peace at any price is indeed an expensive luxury. But peace bought at a fair price is a bargain. It's "wonderful."

J. H. VanDeventer

Special duty trucks gather steel samples for the laboratory.

A truck is unloaded at the laboratory, and immediately starts another round trip.

Plate samples are punched to rough form, then milled. Others are sawed, turned, drilled, etc., as required.

Many samples undergo rigid chemical tests.

Metallurgical tests are extremely important for quality control.

Inland Tests Steel by the Ton

Operator determining physical properties on one of the many tensile testing machines in the Inland laboratory.

Darting from mill building to mill building—many times a day, and at night—are Inland trucks on special duty, a duty of vital interest to every user of Inland steel.

They are the sample trucks which rush samples of Inland products to the main laboratory where all required tests must be completed, reported and checked against specifications before steel is shipped.

Samples are gathered for the laboratory at semi-finishing mills—pieces from billets, slabs, etc., that will be tested before the steel is rolled into final form. Also collected are samples of finished products. Depending upon requirements, every piece of steel delivered to the Inland laboratory undergoes rigid physical, chemical, and metallurgical tests. Many of these tests are special developments by Inland—tests that are fast and extremely accurate.

Yes, Inland daily tests tons and tons of steel to assure every customer that his order will measure up to every requirement.

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The IRON AGE
August 14, 1945

NEWS FRONT

► Application to alloy steel rings of flash welding used extensively in the production of mild steel rings results not only in cutting material costs but materially reducing expensive machining.

The welding cycle must be carefully adjusted to produce sound welds since the presence of high carbon and alloy elements necessary for toughness, hardness or strength of the finished product introduces factors having marked effect on welding characteristics.

► In hot forming magnesium alloy sheet, the use of electric heating for large, irregular forming tools has been found to be the most efficient and adaptable method.

Experiments on heating tools by gas and electric have not yet included induction heating. This method is seen to have definite possibilities and should be investigated in the near future.

► Upwards of 800,000 passenger vehicles may be produced this year, instead of the 250,000 quota originally established. The addition of trucks to this total may swell the volume to close to 900,000 units.

Ford is in an especially fortunate position in the production race, and may possibly build more than the original quota figure himself. Production got under way in July with 359 cars completed, and plans call for 4,000 in August.

Changeover to new models in 1946 may be unusually early, as most builders will be anxious to get into production on improved cars.

► The West Coast, affected less by the end of the European war than were other sections of the country, expects to be more affected by VJ-Day.

► With the withdrawal of the Steel Corp. from the Geneva mill acquisition race, Colorado Fuel & Iron looms as the No. 1 contender. A formal proposal for a lease along these lines is now being drawn up by counsel for the Allen group, which controls CF&I.

► The Allen syndicate continues to blow warmly on the idea of using Henry Kaiser in the Geneva operation, although they disclaim interest in the Fontana mill under any terms.

► Termination of hostilities will probably close down Geneva's open hearths and rolling mills fairly promptly. Navy cutbacks already announced will doubtless affect schedules at the Utah mill.

► It becomes apparent that the cessation of hostilities will find the Red Army occupying strategic portions of Manchuria, possibly the richest Chinese province.

We will enter the peace conference then facing the same impasse in this regard as we did earlier in Poland. In a territory of naturally turbulent political history, and some communistic leanings, we may see the development of some form of secession movement for north China provinces.

► A Chicago firm using polystyrene patterns for precision casting is obtaining accuracies to 0.0002 in. on production runs, compared with 0.200 to 0.003 in. obtained from the "lost wax method".

Experiments are now going forward in using other styrol resins in the polystyrene group. A new firm using polystyrene patterns will start operations in Peru, Ind., within the next ninety days.

A method of preserving many types of Ordnance equipment in cans will require 500,000 tons of steel and aluminum sheet and plate.

The steel containers, 3/16 to 3/8 in. thick, are sealed hermetically after the equipment has been placed inside. Braces and frames are used to hold the equipment rigid.

Sixteen gage sheets will be used for the aluminum containers. Since it is impracticable to make an aluminum container that is airtight, the container is equipped with a ventilator containing a dessicant which balances the pressure and humidifies all air entering the can. This method requires the changing of the drying agent, but it has the advantage that aluminum does not easily corrode.

Flash Welding Alloy-Steel Rings

By P. B. SCHARF
Engineer, Dresser Mfg. Division
Bradford, Pa.

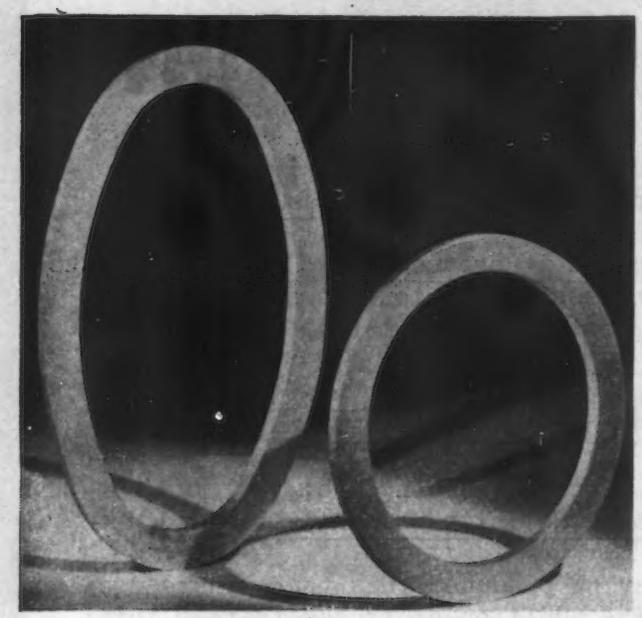


FIG. 1—These supercharger flange rings were flash welded, sized, and delivered at a finished price about equal to the raw material cost under the previous blanking methods. Left: Inlet, 8¼ in. maj ID x 4½ in. min ID x 23/32 in. face x 9/32 in. thick. Right: Exhaust, 6 15/16 in. OD x 5 3/32 in. ID x ¼ in. thick.

. . . The flash-welding methods used so extensively and satisfactorily in the production of mild-steel rings has been applied to alloy steel. Herein the products produced and the techniques employed are described

MANY military devices are fabricated from, or designed around, rings. Due to the necessity for high-precision performance and heavy-duty requirements, many alloy-steel rings have been required since the start of the war. These demands brought about a serious shortage in forging capacity for steel rings. Previously, most types of alloy-steel rings had been made by piercing an ingot slab, forging on a mandrel, expanding to the desired size in a series of dies; or by roll working and then splitting into two or more short rings before rough machining and heat treating.

Many items were punched or torch-cut from sheet steel, thus wasting large quantities of valuable and critical material. As a result, it was inevitable that more rapid and economical methods of production should be sought. The possibility of applying to alloy steel the flash-welding methods used so extensively and satisfactorily in the production of mild-steel rings, was explored and technique mastered.

As an example of what was accomplished, elliptical inlet flange rings and circular exhaust flange rings for aviation supercharger equipment are shown (fig. 1). These rings were formerly blanked from plate at an extremely high cost and with a corresponding high loss in scrap material from the blanking. These two rings were formed to the contours illustrated, flash welded and sized, and delivered to the purchaser at a finished price about equal to the raw material costs under the previous blanking methods. Flash welding of another aviation ring (fig. 2) not only cut material costs, but due to the special section supplied, materially reduced expensive machining.

But there were many problems involved in adapting peacetime methods to the production of alloy-steel rings for war materiel. Demands were considerably more exacting. Alloy steels, selected for highly specialized characteristics, require closer control of all steps of processing. The behavior of these steels under various procedures had to be observed, and processing steps adapted to the specific characteristics involved.

To assure the desired end results,

FIG. 2—By using a special section subsequent expensive machining was materially reduced for the supercharger outlet flange rings; 16 in. OD x 11 13/16 in. ID x 1 3/16 in. deep, 27/64 in. average thickness.

raw material purchases must be carefully controlled, particularly as to chemical, physical, and dimensional properties. Alloy steels are substantially more difficult to process than mild steels. With lower ductility more accuracy and care are required to produce specified form and dimensions. The alloy steels have greater resistance to permanent deformation, in this respect being exemplified by spring steel, requiring special methods and tooling to avoid spoilage. Additional steps in fabrication may sometimes be required, since in many cases less work can be done in any one step.

Heat treatment may be required at one or more stages in order to return the material to a proper condition for further working. The presence of high carbon and alloy elements, necessary for toughness, hardness or strength of the finished product, introduces factors having marked effect on welding characteristics, and calling for a careful adjustment of the welding cycle to produce sound welds.

The manner in which these difficulties have been overcome can be illustrated by considering the manufacture of a roller bearing path ring with an approximate inside diameter of 61 in. and a section of 1⅞ × 1½ in. (fig. 3) This ring is made from SAE 52100 steel and held to a tolerance on roundness of 1/16 in. and on flatness of 1/32 in. In addition, it is essential that in the finished ring the weld and the weld area should have no appreciable difference in properties from those of the non-welded material.

This steel is a most difficult alloy to process and was formerly considered to be virtually unweldable, due to its exceptionally high carbon content.

Early experiments, however, proved that the alloy could be successfully welded under properly controlled conditions. As can be seen from table 1, SAE 52100 is a chromium steel of high carbon content, falling within the general classification of stainless steel. Steels containing 1 pct carbon and chromium of 1½ pct, by virtue of their hardness and resistance to wear, have become the preference of bearing manufacturers. These steels have, primarily, a deep hardening characteristic, where the actual hardness of the finished product is nearly uniform from surface to center.

The raw material forms usually used for rolling rings are bars, plates or special sections. In this case, square or rectangular shaped bars are used. As grain structure is of great importance, it is usually desirable to anneal the bars. They are also machine-straightened to insure maximum accuracy. Rigid and detailed inspection is essential, as flaws are particularly critical in this material. Brinell hardness tests are made at several points along each bar.

FIG. 3—This roller bearing path ring of SAE 52100 steel has been held to a tolerance of roundness of 1/16 in. and the flatness of 1/32 in. This steel is a difficult alloyed process and was formerly considered to be virtually unweldable due to its high carbon content. 64 11/16 in. OD x 60 15/16 in. ID x 1½ in. thick.

On the bending rolls, preferably of the pyramid type, the bars are rolled to the desired curvature until they conform to gage. Care must be taken to make the resulting rings as true to size and roundness as possible in order to keep subsequent sizing to a minimum. If the ends of the bars are overlapped when roll-bending, the ring is trimmed to a calculated inside circumferential length, sufficient excess stock having been allowed for removal of the straight stub portions on each end. If the bars are cut to the exact required length before rolling, a press is used to "dicker" or shape the straight end portions to conform to the desired curvature of the ring.

The welder shown in fig. 4 is used for sections of 4 to 12 sq. in. and 96 to 36 in. in diam. Automatic control of the operation is absolutely essential as the precision required cannot be obtained by procedures introducing the possibility of human variations. Hydraulically operated and electronically controlled welders produced the most suitable results in this type of steel.

The rate of upsetting is of particular importance in welding steel of this type. The time, heat, and upset cycle must be carefully controlled as tests made at various speeds of upset have shown that too slow or too rapid upset produces unsound welds.

Metallurgical examination of the welded ring may be reviewed by referring to fig. 5. These micrographs were taken at 100 diameters, etched in nital, at the positions indicated.

FIG. 4—This welder is used for sections from 4 sq in. to 12 sq in. and rings of 96 in. to 36 in. in diameter. Automatic control of the operations is essential in order to obtain required precision.

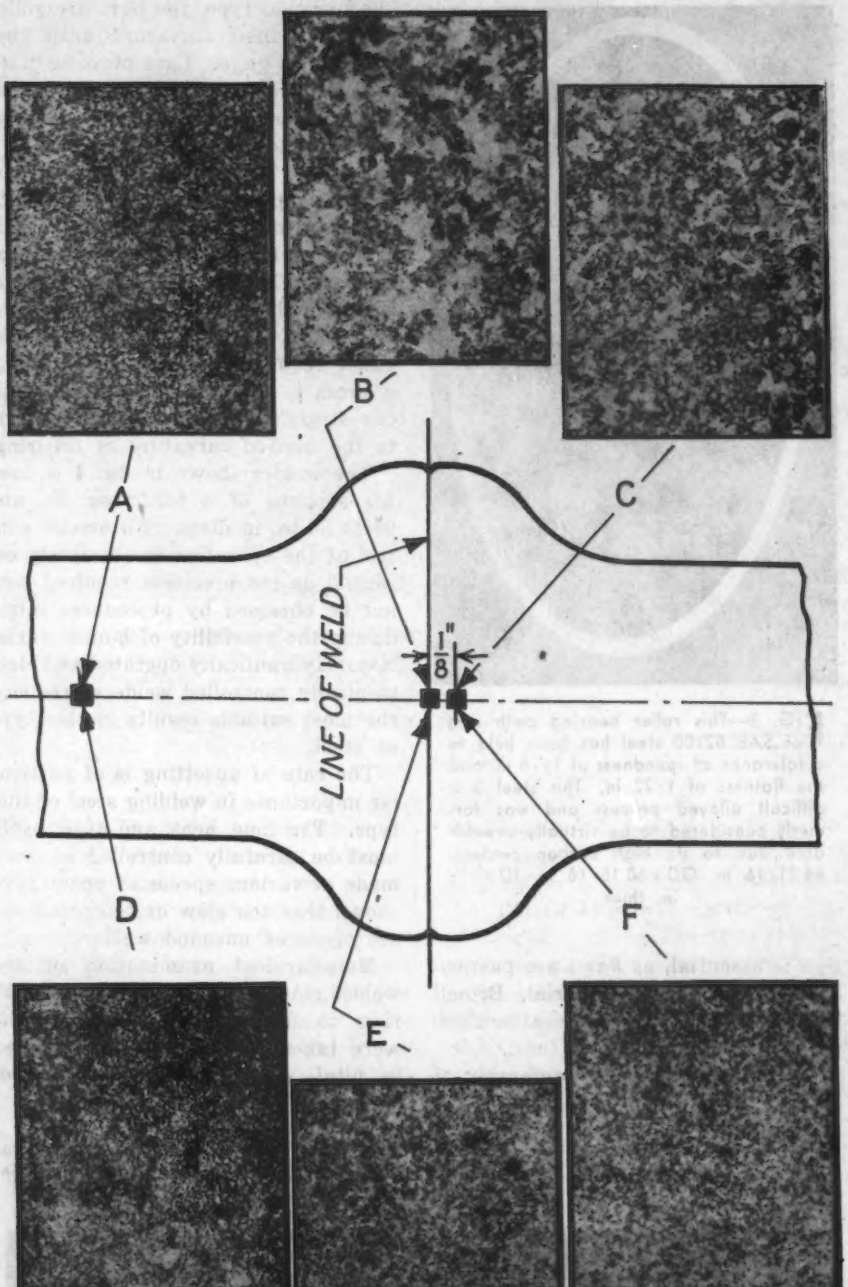


FIG. 5—Micrographs at 100X, reduced one half, were taken at positions indicated. Within the heat affected zone, B and C, as the temperature during welding was above the critical, the crystals are large and the area is very hard and extremely brittle. After proper heat treatment, grain refining in the weld is shown at E, and in the heat affected zone at F.

Spheroidized structure is shown at "A" in the unaffected area. "B" in the view is directly in the line of the weld, and "C" is in the immediate heat affected zone, as welded. It is clearly indicated that in the ring, outside the heat-affected zone, good machinability and workability exist. Within the heat-affected zone, however, the temperature during welding was above the critical, with the result that the crystals are large, the area being very hard and extremely brittle.

Hypereutectoid steels such as SAE 52100 have been observed having a maximum hardness of 600 Brinell (746 Vickers) in extreme cases of hardening after welding. In production on these rings the normal average tested hardness is shown graphically by line "A" in fig. 6.

Under the circumstances it is necessary at this point to introduce heat treatment to condition the weld area for further processing. As rapidly as the rings are welded and disengaged from the welder dies, chippers and grinders are used to remove all excess material due to upset and flashing. This operation is completed while the weld is still hot and the material is relatively soft. The heat treatment usually accorded to the ring is either a localized annealing or a full anneal of the entire ring. The latter has been the most effective method in shop practice.

A temperature recording chart is made of each furnace run and inspected before the next operation in the manufacture of rings is attempted. When heat treatment is properly done, grain refinement in the weld is as shown at "E," and in the heat-affected zone, shown at "F," fig. 5. The ring is again in the proper metallurgical form for further processing. No attempt is made here to heat treat rings for the final physical characteristics, however. The treatment given is one restricted to hypereutectoid steels and usually applied to the steel previous to final hardening in order to assure uniformity in the hardness as later developed from final heat treatments. Hardness curve after this anneal is shown graphically in fig. 6 by line "B."

The desired physical effect is accomplished by this heat treatment, wherein the carbide is in a globular or small nodule condition. The hardness is brought down in the weld and the heat-affected zone to that of the original bar. The desired elongation characteristics are restored and brittleness is thereby removed.

The sizing operation is the next step in the line of production. One of several methods may be used. The ring may be expanded circumferentially on a tapered plug in a hydraulic press, tire-set or shrunk, or uniformly expanded on an expanding machine. The latter method was used on the rings under consideration. Special dies were used to insure that the rings, when expanded, would be round and substantially flat. Inspection gages and face plates are used to check the completed ring. Rings are checked

TABLE I

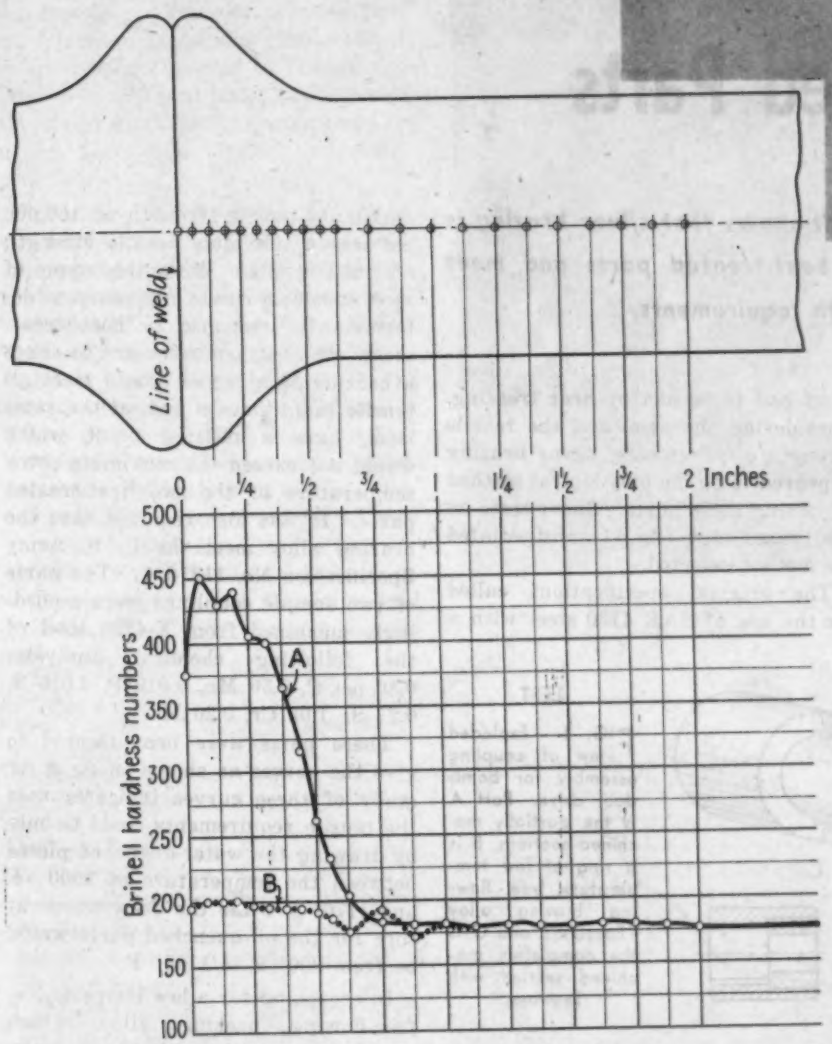
Chemical	SAE 52100 Pct	O. S. 477-Cl.3 Pct
Carbon	0.95 to 1.10	1.00 to 1.10
Manganese	0.20 to 0.50	0.20 to 0.50
Silicon	0.15 to 0.30	0.10 to 0.30
Chromium	1.20 to 1.50	1.20 to 1.50
Phosphorus (max)	0.030	0.030
Sulphur (max)	0.035	0.030
Nickel (max)	.....	0.20

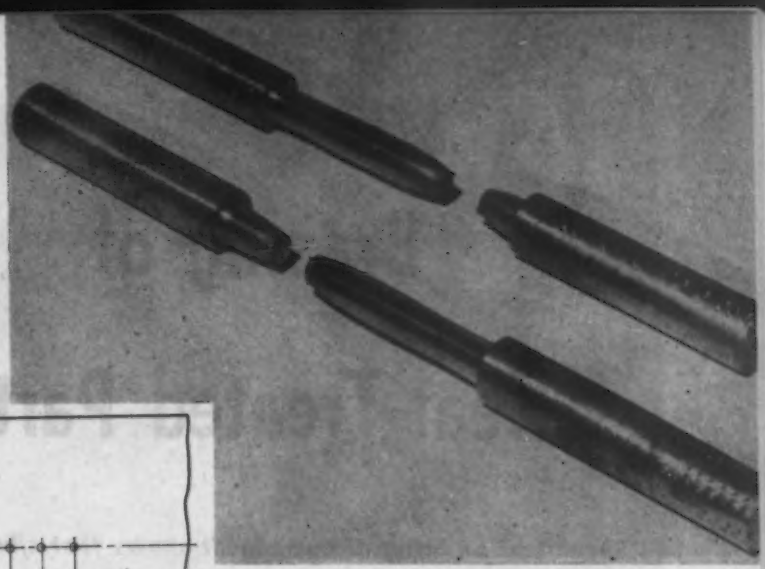
for inside diameter, circumferential length inside, flatness and sectional dimensions.

Specimen bars of SAE 52100 steel before and after flash welding were turned to ½ in. diam. and tensile tested. In the welded specimen, the weld was in the middle portion of the

BELOW

FIG. 6—Line A indicates the normal average tested hardness after welding. Line B indicates the tested hardness after heat treatment.





ABOVE

FIG. 7—The breaks in the "as-welded" and the "annealed" bars are characteristically cup-shaped. Above, as annealed. Below, as welded.

turned specimen. In all cases of properly heat-treated bars, tensile fracture of the welded specimen occurred in the parent metal at a distance well removed from the weld. The breaks in the "as welded" and the "annealed" bars were characteristically cup-shaped, as illustrated in fig. 7. The average tensile strength and other physical characteristics are shown in table II, specimens Nos. 4, 5 and 6. Specimens Nos. 1, 2 and 3 are tabulated for comparison and their interpretation shows how critical the proper heat treatment is to the success of this process.

In the process as described the welding stresses in the resulting ring are at an irreducible minimum. The residual stresses in the ring after expanding are at a minimum and very equally displaced around the ring form. Symmetrical stresses alone do not reduce the strength of the weld.

In the manufacture of finished bearing races or roller paths, the final finish given the surfaces on the steel has a greater influence on its fatigue strength than any characteristic attributable to the weld.

Flash welding of alloy steels is not only practical but advantageous. Results are uniformly more accurate than those resulting from previous methods, the amount of necessary subsequent machining being greatly reduced and even eliminated in many instances. The savings in scrap materials are appreciable, a point of particular importance in the case of high-cost alloys. Most rings can be made cold, thus eliminating cost of furnace heating. Tool and die maintenance is generally less than with other processes. Production line operation is facilitated.

TABLE II

Physical Properties of Welded SAE 52100 Steel

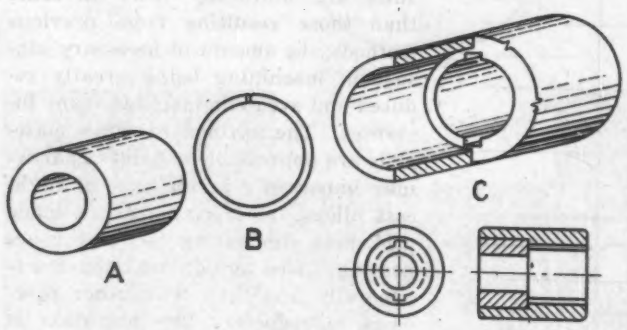
Specimen No.	Yield Strength, Psi	Ultimate Strength, Psi	Elongation in 2 In.	Reduction in Area, Pct	Brinell Hardness of Bar	Remarks
1	112,000	224,000	19	30	285	Parent metal bar heat treated to 285 Bhn, broke approximately in the middle of the machined length, cup break.
2	65,000	120,000	16	31	285	"As-welded" bar broke in weld, cup break, inadequate heat treatment.
3	62,000	109,000	18	39	285	Welded and heat treated to 285 Bhn, broke in weld, inadequate heat treatment.
4	86,500	120,000	23	48	175	Parent metal bar heat treated to 175 Bhn, broke approximately in the middle of machined length, cup break.
5	63,800	94,800	23	47	175	"As-welded" bar broke outside of weld, cup break. Fig. 6.
6	64,900	98,000	22	43	175	Welded and heat treated to 175 Bhn, broke outside of weld, cup break, correct heat treatment indicated. Fig. 6.

Brazing of Heat-Treated Parts

. . . Shear test on integral component shows that silver brazing is a satisfactory method for joining heat-treated parts and meet definite tensile strength requirements.

AN unusual production problem involving the joining of two heat-treated parts and at the same time have the integral part meet a definite tensile strength requirement, was faced by the Western Gear Works, Seattle, as the result of a change in design. Because of the particular steel specified, this requirement had to be met by heat treating. Considering the steel and the tensile strength requirements, silver brazing appeared to be the only logical method of joining these parts. Shear tests on the brazed unit (fig 1) substantiated the method selected.

The original specifications called for the use of SAE 4130 steel with a maximum tensile strength of 160,000 psi and a minimum tensile strength of 130,000 psi. With this type of steel specified, it was necessary to determine its response to heat treatment. It was then necessary to select a brazing alloy which would meet all tensile requirements and, at the same time, have a melting point which would not exceed the maximum draw temperature of the two heat-treated parts. It was also required that the brazing alloy meet the U. S. Army Specification No. 11316-A. The parts of two sample couplings were accordingly machined from X-4130 steel of the following chemical analysis: 0.30 pct C, 0.50 Mn, 0.019 P, 0.019 S, 0.27 Si, 1.05 Cr, 0.20 Mo.



LEFT

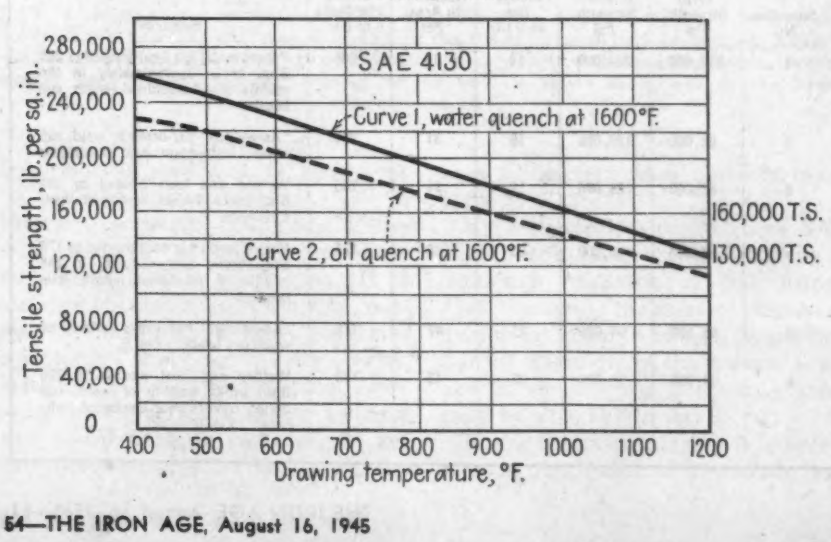
FIG. 1 — Exploded view of coupling assembly for bomb door drive. Part A is the partially machined sections, B is a ring of low temperature, free-flowing brazing alloy (Easy-Flo) and C is the completely machined section with keyways.

These parts were heat treated to give the curves as shown in fig 2. A study of these curves indicates that the tensile requirements could be met by drawing the water-quenched pieces between the temperature of 1000° F and 1170° F while the draw temperature for the oil-quenched parts would be from 900° F to 1100° F.

In searching for a low-temperature, free-flowing brazing alloy which would meet tensile requirements in the braze and also the above mentioned specifications, Handy & Harman Co.'s Easy-Flo was found to be satisfactory.

Since it was known that the melting point of the brazing alloy was 1175° F, the experimental parts were cleaned, fluxed and assembled with a ring of brazing alloy and furnace brazed at a temperature of 1200° F (see fig 3). The slightly higher furnace temperature helped to keep the time in the furnace at a minimum. From this procedure the parts assembled by brazing were completely drawn at 1200° F on the final brazing operation. After brazing the water-quenched parts at 1200° F, the asembly showed a hardness of Rc 27 to Rc 28, which corresponds with a tensile strength of 128,000 psi. This tensile strength corresponds to the expected hardness

FIG. 2—Tensile strength-temperature curves of SAE 4130 steel of which parts were fabricated.



as shown on curve No. 1 in fig 2 for the 1200° F draw. When this test showed that tensile strength dropped below the 130,000 psi, it was necessary to ask for a change in tensile specifications or material specifications. Accordingly, a stress analysis of the assembled parts was made by the customer. The test revealed that the minimum tensile requirement could be safely lowered to 115,000 psi. With this new and lower specification there was no difficulty encountered in using the material as originally specified.

Shear Test

As a final test, a special fixture was constructed for the purpose of shearing some of the completed couplings to destruction. The test revealed that the shearing point was between 34,000 and 35,000 lb. The brazed area has a diameter of 0.660 in. and a length of 0.5 in. This is an area of 1.05 sq in. which represents an average shear strength of 32,800 psi. Using a shear value of 25,000 psi this coupling is good for a torque load of: 25,000 x 1.05 x 0.660/2 = 8662 in.-lb.

Comparing this with the torque load that two keys will develop, where:

Tensile strength	= 96,000 psi
Shear	= ¾ (96,000) psi
Key size	= ⅛ in. square
Key length	= 0.573 in.
Shaft diam	= 0.500 in.
Shaft radius	= 0.250 in.

Torque load = ¾ x 96,000 x ⅛ x 0.573 x 2 keys x ¼ = 2586 in.-lb.

Comparing these figures, the silver brazing has a factor of safety of 8662/2586 or 3.5 over the strength of the two keys.

The variation of tensile strength with joint thickness is shown in fig 4. This index gives the reason for having the joint thickness 0.0015 in. or a variation in diameter of 0.003 in. between the parts.

FIG. 3—Showing preparation of parts before furnace brazing.

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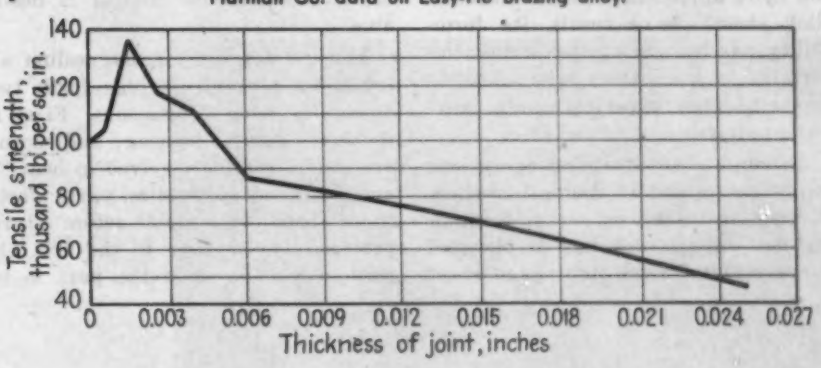
BELOW

FIG. 4—Relation of joint thickness to tensile strength compiled from Handy & Harman Co. data on Easy-Flo brazing alloy.



Effect of Production on the Properties of Iron Powder Compacts

An investigation of the properties of iron powder products made from powders produced by various processes was conducted by W. Dawihl and U. Schmidt and reported in *Stahl und Eisen*, Vol. 65, Jan. 4, 1945, pp. 9 to 14.

Porosity and structure were examined by micrographs at high magnification and microhardness tests were made. It was found that the effects of the manufacturing process were still quite marked, even after sintering at 2642 deg. F. The pores in parts made from iron powders that had been melted are uniformly distributed, while the distribution is not uniform if the iron had not been melted, sponge iron powders for example. Subjecting powders to severe deformation, as when made by the cold stamping of sheet iron, was observed to have a detrimental effect on the sintering properties and on the growth of the ferite.

Microhardness readings indicated that the fusion of crystals gave rise to additional stresses called sintering stresses. These stresses it is suggested were probably the cause of the variations in micrahardness with the varying methods of producing the powder.

Additional time and power consumption in making the powder can in some cases be compensated by simplification in the finishing processes. An example of this is cited in the case of a compact being made from a powder produced by directing two streams of particles one against the other. Sintering then is required only to produce a soft and easily deformed part. With powders made by other methods, forging and recrystallization are necessary to produce the same deformability.

Hot Forming Magnesium Alloy Sheet

. . . Hot forming of magnesium alloy sheet using electrically heated tools is showing particular efficiency. Herein, data are presented on temperatures, heating methods, types of forming, gage of material, and most satisfactory lubricants.

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By J. B. WEST
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THE increased demands of aircraft designers for lighter-weight parts have led to more and more applications for magnesium alloy sheet. As a result, its formability has become of the utmost importance to fabricators, who intend to translate such experience into post-war products.

Although many forming operations can be performed on magnesium sheet at room temperature, severe forming can best be accomplished at elevated temperatures. Since light gage sheet will not retain sufficient heat during forming operations, the forming tools must be heated in some way, and accurate temperature control is desirable.

The hot forming of magnesium alloy sheet generally brings forth two objections from fabricators. First is the extra cost of heating; and second are the difficulties involved in heating and operating large dies, particularly those used in double-action draw presses. The answer to the first objection depends upon the part to be formed. In many cases, the additional cost of heating is offset by the fact that intricate shapes can be formed in magnesium sheet with fewer operations and fewer sets of tools than are required when forming other materials.

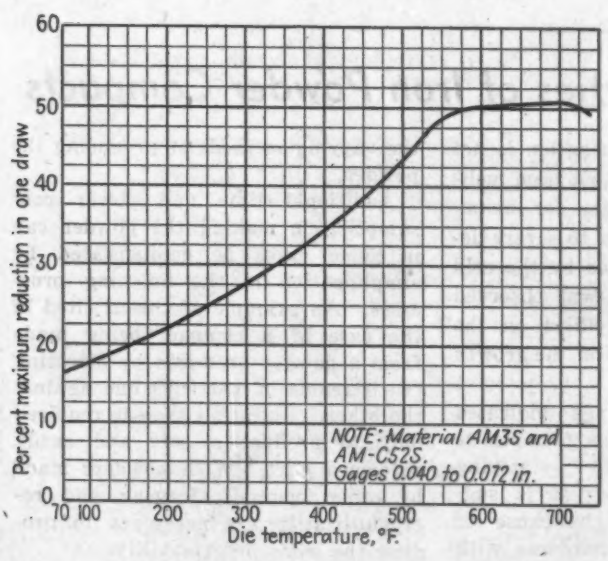

FIG. 1—This draw-reduction graph for light-gage magnesium-alloy sheets is the basis of all magnesium sheet drawing.

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For other data on the drawing of magnesium alloys, see THE IRON AGE *issues of July 5, 1945; May 10, 1945; Nov. 30, 1944; and July 27, 1944.*

The solution to the second problem requires additional investigation before a final decision can be reached. Considerable progress has already been made, however, and Alcoa engineers have arrived at several conclusions. These are:

(1) By following standard practices on the design of magnesium parts regarding such details as radii and draw reductions, severe forming of magnesium sheet products, when done in the temperature range of 400° to 700° F., can be on a par with the more common sheet materials. The information contained herein, as determined by investigation, may be used to govern the choice of temperature, heating methods, type of forming, gage of material and lubricant.

(2) Electric heating has been found to be the most efficient and adaptable method for heating large, irregular forming tools. The variety of electric-heating units available—tubular, ring, cartridge, and strip—permits the application of electric heat on any type of tool. Ring or strip heaters should be used whenever possible and tubular heaters only in emergencies.

(3) The detailed wiring diagrams, description of equipment used, and heat requirements for the parts on which Alcoa experimented, may serve as a guide for future designs, but should not be considered a criterion of design.

(4) Although considerable work has been done on gas and electrical heating, experiments have not yet

included induction heating. This method may have definite possibilities and should be investigated by fabricators in the near future.

Pilot production jobs and experimental work provided the data used in making the graph, fig. 1, which shows the maximum reduction per operation practicable for temperatures in the range of 70° to 700° F. This graph served as the basis for determining the number of operations (or draws) required and the temperatures at which the draw must be performed. Factors such as die radii, punch radii, clearance between punch and die, die material, blank size, and type of draw tools and equipment, were determined by past experience with aluminum as well as magnesium.

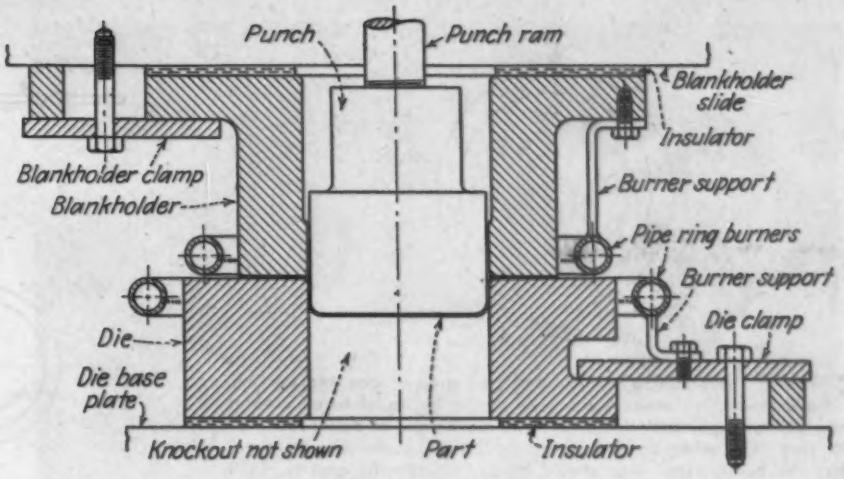
Gas Heating For Small Parts

Heating of tools was first confined to manual torch heating of small existing tools and the fitting of natural gas ring burners to small and medium sized standard designed tools. Fig. 2 and 3 illustrate gas burner installations on double-action toggle presses. Such applications were successful on a production basis for small parts which required only relatively slight forming. For severe forming, such as that encountered in a deep drawing operation of approximately 30 pct to 50 pct reduction, the fluctuations of heat and its effect on blankholder pressures, plus the expansion of the tools and moving parts, made this method of heating unsuitable on a production basis. Attempts to use gas heating on several deep-draw dies used to form parts of aircraft oil tanks proved that it could not be utilized for larger tools, since the area of application of the heat and the amount of heat available at the working surfaces were not satisfactory to provide the required temperature.

Gas heating, however, was favored for the initial work on hot forming of magnesium because of its economy in both time and money. A relatively small number of parts was needed and gas burners were inexpensive and easy to install, as shown in figs. 4 and 5.

Electrically Heated Tools

The need for a different source of heat in order to make further technical advancements in the field of severe magnesium forming, led to an investigation of electricity. The results obtained have proved very encouraging. Commercial electrical heating units adaptable to the type of tooling under consideration were available in a sufficiently wide range of types, sizes, and wattage capacities to accommodate anything from small embossing tools to large deep drawing tools. Furthermore, this type of heating offered absolute temperature control, eliminated the hazards of fire and overheating of presses, and created safer working conditions.



Electrical heating was first attempted on small tools. Initial experiments were carried out on existing single-action embossing tools, in which instant tubular heating units of 500 to 600w capacity were wrapped and securely fastened to the outside diameter of the tool. Since the range of working temperature for this type of operation was wide, lack of control introduced no serious problems. Inadequate surface contact between the tubular type unit and the tool, however, resulted in inefficient heating and a short heater life. Insulation in these applications consisted of asbestos packing around the outside of the heaters, and asbestos shingles placed between the tools and the press. Solid tools up to 6 in. in diameter with a round or oval outside contour can be maintained in this manner at temperatures around 600° F.

The first tool specifically designed

ABOVE

FIG. 2—The installation of gas burners in a magnesium drawing operation.

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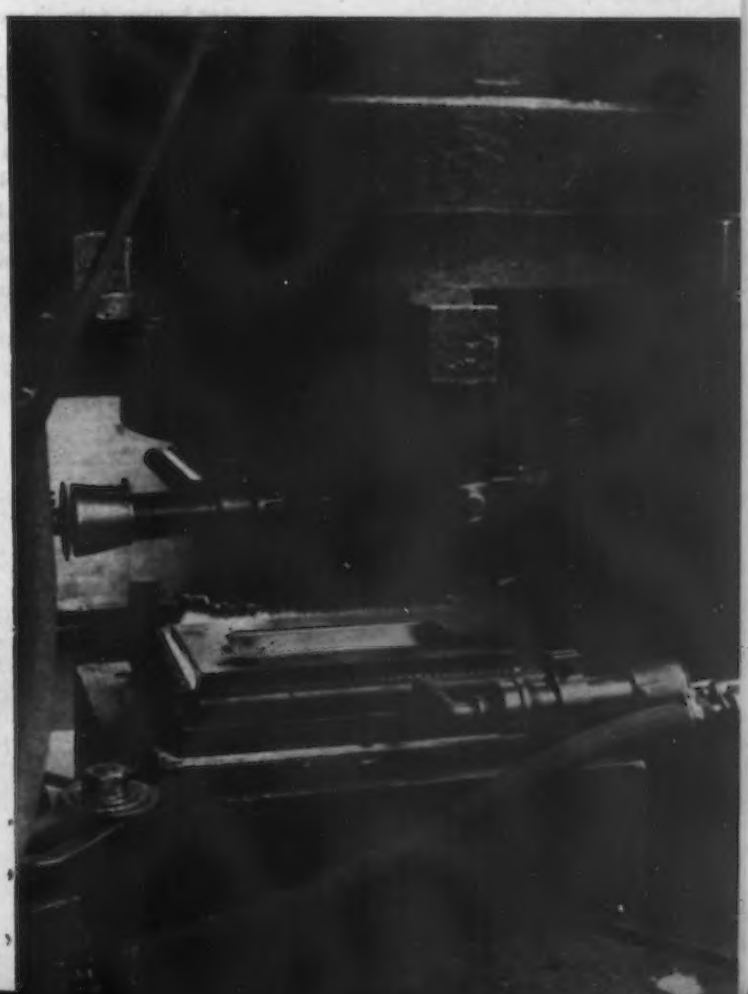
RIGHT

FIG. 3—This production installation of gas burners is the same as that shown schematically in Fig. 2.



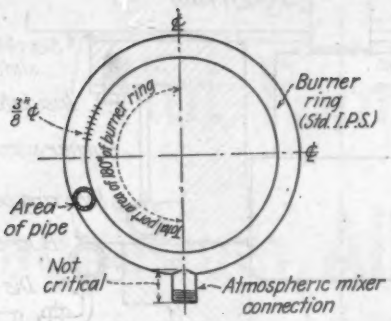


FIG. 4—In determining the size and port area of gas ring burners, the cross-section area of the pipe should be equal to or greater than one and one-half times the total port area of half (180°) of the ring. The mixer connection should be the same size or larger than the burner ring. Gas should be of 0.57 specific gravity, 1030 Btu. per cu ft with a line pressure of 20 oz per sq in. I.P.S. is dependent upon the volume of material to be heated. In general, for dies 6 in. in diameter or less, use ½ in. I.P.S.; dies 6 in. to 10 in. in diameter, use 1 in. I.P.S.; and dies 10 in. to 16 in. in diameter, use 1½ in. I.P.S. It is not advisable to attempt to gas heat tools greater than 16 in. in diameter.

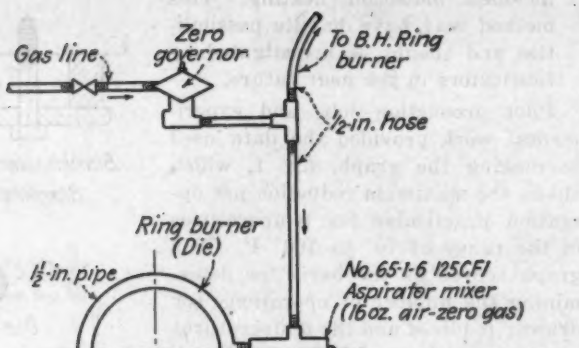


FIG. 5—This schematic drawing illustrates the ring burner and mixing unit for gas heating draw and stamping tools.

to accommodate electric unit heaters was the dimpling tool illustrated in fig. 6. In this case ring heaters, with practically 100 pct heating surface contact, were installed with excellent results. Since the largest commercial unit now on the market is only 10 in. in outside diameter, ring heaters cannot be used on large tools. Wherever applicable, however, the ring heater should be used as a source of heat.

Since tubular heaters were found to be inefficient and difficult to install properly, a small embossing tool of the type previously described was fitted with cartridge heaters. These were inserted in close fitting holes which were bored from the bottom face of the tool to within 0.25 in. of the area to be heated. This setup resulted in more uniform heat and offered a neater and more permanent job.

The next step in electrical heating was its application to a set of draw tools designed to form a 5-in. diameter hopper tube in two operations, as shown in fig. 7. In this application the first operation draw tools were heated by using cartridge heaters as described. The formed part represents a total reduction of 65 pct. It required a first draw die and blankholder of 18 in. diameter with a punch diameter of 8¾ in., and started with a circular blank of 0.051 in. by 16 in. in diameter. The tools used in the second operation were a die (which had an outside diameter of only 9¾ in.), and an inside blankholder and a punch of 5 1/16 in. diameter. In this particular instance, ring heaters are best suited for the die and cartridge heaters for the blankholder. Heat calculations for this draw are shown in table II.

With parts having proportions similar to that shown in fig. 7, only the die and blankholder are heated. For the second draw the punch was deliberately cooled with water. If the punch were heated, the area of the part first formed would, at the elevated temperature, have insufficient strength to pull the balance of the material under the blankholder into the die cavity. The ratio of punch area to blank area at which the punch should be cooled rather than heated has not yet been established. It is a matter of judgment and trial rather than calculation.

Drawing of Oil Tanks

Main engine aircraft oil tanks of 40-gal. capacity furnished the problem of using electrically heated tools for deep drawing large, light gage sheet parts on a production basis for

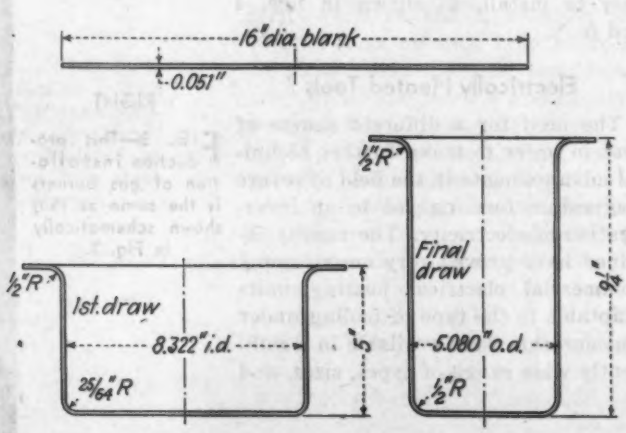
LEFT

FIG. 6—Electrically ring heated dimpling tool.

o o o

RIGHT

FIG. 7—A hopper tube drawn to final shape from a circular flat in two draws.



the first time. The design of this particular tank required different and more existing techniques in heating, heat control, and tool design than that of any job previously attempted.

Because this 40-gal. tank had to fit in the space formerly used by a 28-gal. tank, it had numerous deformations consisting of bumps and indentations for clearance purposes. As a result, two pieces were used for the skin; and two drawn shells of unusual size, depth and shape were used for the heads. It was decided that the bottom skin should be formed on a stretcher press using a hollow, cast aluminum male die heated with strip heaters, and that the right and left heads and the top skin should be drawn in double-action toggle presses of 275-ton capacity. An air-cushion knockout, two draw operations for the right and left-hand heads, and hollow cast-iron dies, blankholders and punches heated with strip heaters were employed. The severity of the forming operations required to produce these parts dictated the use of optimum temperatures. In addition, the large size, irregular shape and heat capacity of the necessary tools seemed to preclude any possibility of heating by the methods of torch or gas, tubular, ring or cartridge electric heaters.

To obtain some degree of heating efficiency, hollow tools, rather than the usual solid type, were designed to operate with a minimum heat input and to allow placing of the heating elements as close as possible to the working faces. Hollow tools of approximately 1¼ in. wall thickness are satisfactory, since hot drawing of magnesium does not require the strength of solid tools. This is explained by the fact that hot working requires only 25 pct of the pressure needed for room-temperature working.

The top half of one of these dies is shown in fig. 8, which also illustrates the installation setup used for the strip heaters. Their selection for this type of tool was governed by the available contact area and their adaptability to contours.

FIG. 8—The installation of electrically heated strip heaters.

TABLE I

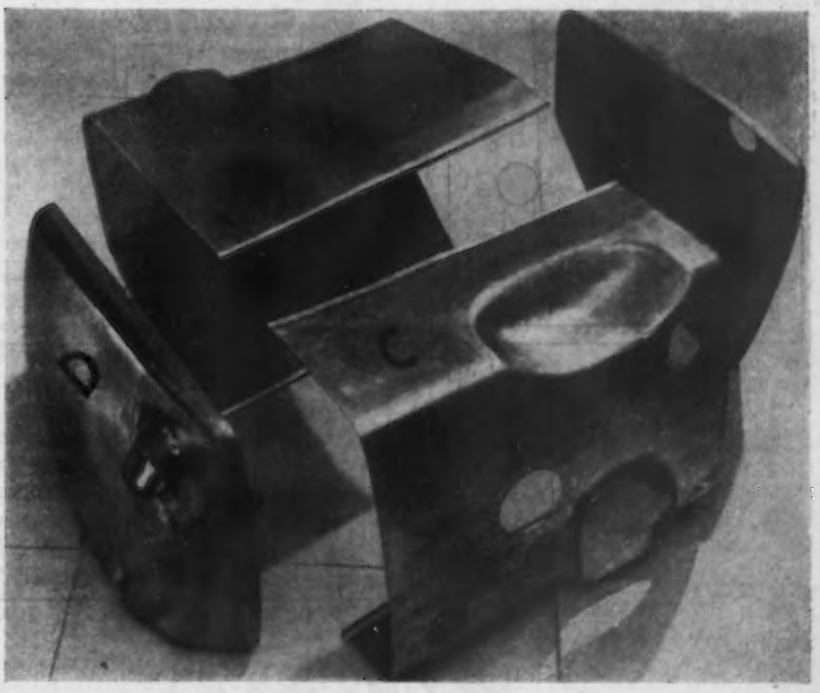
Temperature Settings On Heated Tool Parts

Part	Temperature, °F	
	Right-Hand Head, (Fig. 11)	Left-Hand Head, (Fig. 12)
Punch	600	600
Die	450	550
Blankholder	450	550
Preheat furnace	700	700

The various parts, as formed by the presses, are shown in fig. 9. The tolerance and production rate requirements justified almost complete tooling. Complete thermostatic control of all heated operations was required, and the temperature settings shown in table I were determined from actual production.

When using the heaters as shown in fig. 11. It was difficult to maintain die and blankholder temperatures for more than an hour of steady production. This resulted partly from insufficient heaters but mainly from heat losses into the press and the work. For satisfactory shells, it was necessary to operate at 550° F. This was also found to be the maximum temperature that could be obtained with the setup shown in fig. 14. Future designs should provide for greater heat losses. In the initial investigation transite board or asbestos

FIG. 9—The four parts comprising the 40-gal aircraft engine oil tank. The botton skin, A, is formed on a stretcher press using a hollow, cast aluminum male die heated with strip heaters. The right and left heads, B and D respectively and the top skin, C, are drawn in double-action toggle presses of 275-ton capacity.



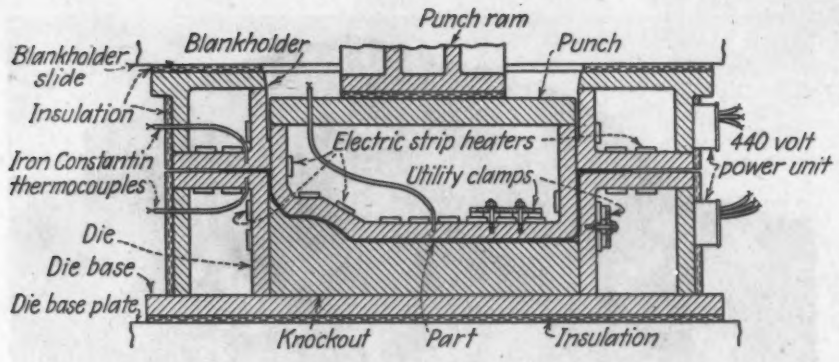


FIG. 10—Strip heater installations on the top skin of the 40-gal oil tank.

shingles were placed between the tools and the press for insulation. In the case of tubular and ring heaters, asbestos packing was placed around the outside of the tool. With the larger size tools, blankholder pressure continually changes if the tools are set on transite or asbestos, because the pressures crush the insulation material and it acts as a cushion rather than a positive base. From experience thus far, it has been found that the only insulation with sufficient strength for severe draw work is a thickness of ½ in. or more of 0.020 in. to 0.032 in. polished stainless steel sheets, each of which is pierced with irregularly spaced holes to form dead air spaces. In addition, the outside of the die and blankholder should be fitted with insulating material to minimize heat losses as well as to protect the press operators.

The general tool design and wiring setup of final draw tools for the left-hand heads are shown in figs. 10 and 11. In addition to the development of proper blank size, radii and general operating procedure, tryout and initial production of this part brought forth the associated problems of heat distribution in the tools, lubricants, insulation, die pickup, blankholder pressure variations, and preheating of the blanks as they affected production rates and the quality of the shells.

The rough dimensions of this finished shell are 17½ x 23½ x 6¼ in. deep. The original blank was 0.072 x 27 x 33½ in., alloy AM3S-O. For reasons of blankholder pressure, this blank was increased to 28 x 33½ in. Furthermore, the blank was left rectangular in shape, contrary to the normal practice of developing an irregular blank for irregular shapes in order to keep the blankholder pressure uniform over the die face. The maximum thickness of the shell is at the approximate center of the deep side (fig. 9C) and averages 0.102 in., while the minimum thickness is in the deep corner (fig. 9C) and averages 0.060 in. The original gage was deliberately made 0.072 in. in order to take care of such thinning.

All the radii on the shell are 1½ in., while the draw radius (radius on the die) is ⅜ in. or 5T. Although too small a radius would have caused fractures during the drawing operations, the radius had to be kept at a minimum to prevent the formation of wrinkles in the sides and bottom of the shell. The correct balance of these two factors was determined during the actual tryout of the tools.

Usual Lubricants Unsatisfactory

At temperatures in the 600° F. range, lubrication becomes a real problem, not only from the standpoint of allowing the blank to slip readily between blankholder and die, but also from the standpoint of preventing scratching, galling and pick-up during the drawing operation. Mutton tallow and paraffin, the lubricants usually employed on the most severe aluminum draws, break down completely. Ordinary laundry soap, which is frequently used for magnesium spinning and drawing, is unsatisfactory above 400° F. Normal heavy lubricating oils flash at various temperatures but always below 600° F. Although graphite, with or without a vehicle, is fair from a drawing standpoint, it is difficult to remove completely, and, if allowed to remain on the part for any length of time in the presence of moisture, corrosion will ocur. A mixture of Tube Draw and Mica was found to be satisfactory for the parts under discussion. Cyltal also brought good results. The spirits used with Tube Draw to maintain a viscosity at which it can be handled, will flash occasionally but the lubricant quickly burns off and leaves little or no residue. Rapid application of Tube Draw requires preheating of the blanks which, incidentally, should be preheated in any event. To minimize caking of the lubricant on the punch and knockout, no lubricant was desired

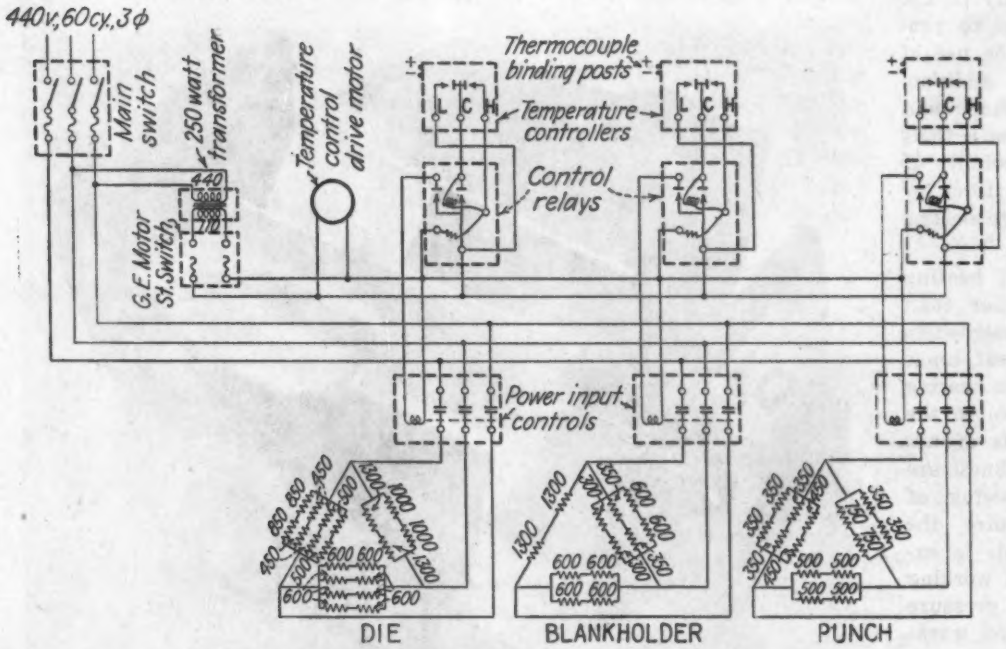
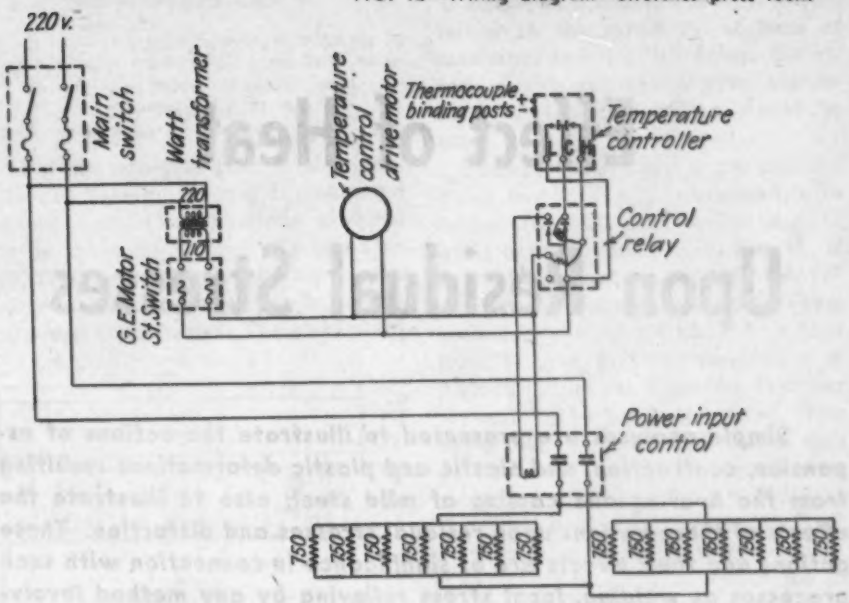


FIG. 11—Wiring diagram—Left-hand head tools.

in the center of the blank in the aforementioned job. Consequently, the logical setup of preheating the blanks in a bath of the lubricant or dipping in the lubricant after preheat could not be employed. Therefore, an electrically heated batch type furnace was used for preheating.

Even with Tube Draw, excessive pickup and consequent deep scratching of the sidewalls of the shell were encountered. Nor did the use of cast-iron tools help this condition. Contrary to normal practice, all magnesium sheet that is to be processed within 3 months after its delivery is used without the standard chrome pickle coating principally because this coating increases pickup troubles in draw work. Sheet obtained from the mills should, however, be ordered with an oil coating. Solution of the problem of pickup was further aided by eliminating the normal amount of magnesium oxide that is rolled into the surface of the sheet during final cold rolling. This oxide was removed by immersing the as-rolled material in a 1 pct solution of citric acid for 10 min. at room temperature. The resultant very finely etched surface also helped to hold the lubricant as the metal moved over the die face and radii.

FIG. 12—Wiring diagram—Stretcher press tools.



Variations of as little as 25° in the temperature of any of the tools sufficiently altered the blankholder pressures and the lubricating effect to produce wrinkled shells with decreased blankholder pressures and fractured shells with increased pressures. This proved the necessity of having accurate temperature control.

The tools for both the right and left-hand heads were originally designed for two draw operations in accordance with standard aluminum practice. During the tryouts, however, it was found unnecessary to use the first operation tools and both parts were made in one draw.

The stretcher press operation on the part shown in fig. 9B was performed over a hollow, cast-aluminum form, which was fitted with strip heaters, as diagrammed in fig. 15, to maintain a temperature of 600° F. Since the sheet material has almost point contact with the tool for about the first 90 pct of the operation, additional heat was applied by a gas burner to the area of the severest stretch. This was brought to the work after the sheet had been clamped in place in the jaws of the press. A more efficient method might be to lay an electric heating pad over the sheet during the operation. The long offset in the center of one side of the shell was set to the block with an air hammer after stretching but during the time that the shell was still held in tension by the press. Heat calculations for determining the heat input to operate the cast-aluminum stretcher die at 675° F. are shown in table III.

Cyltal was applied to the radii of the tool over which the sheet was stretched but none was applied to the sheet itself. Pickup, particularly with a cast block, was even more of a problem here than in drawing. There is some hope, however, that this condition can be eliminated entirely through the development of heat-resistant rubber sheeting which could be placed between the tool and the part.

TABLE II

Calculations For Determining the Necessary Heat Input to Operate the First-draw Hopper-Tube Die at 675° F

(1) Weight of steel die = 259 lb

(2) Kw-hr required to raise 259 lb of steel to 675° F:

a—Steel watt-hour absorption per °F temperature rise = 9

∴ for ΔT (change in temperature) of (675°–75°) or 600° F required kw-hr input equals

$$\frac{(600)\ (9)}{1000} = 5.4$$

b—Kw-hr input = (weight of die) (specific heat of steel) (ΔT) / 3421

$$\text{or } \frac{(259)\ (0.12)\ (600)}{3412} = 5.45$$

(3) Heat losses from uninsulated surface areas:

Uninsulated surface area = 2.5 sq ft

Watt-hour loss per sq ft = 800 (for steel)

$$\text{Kw-hr loss} = \frac{(800)\ (2.5)}{1000} = 2.0$$

(4) Kw-hr required to attain die temperature of 675° F and operate at 675° F:

(2) 5.4
(3) 2.0
7.4

By insulating some of the surfaces in (3) above, an adequate margin of safety is allowed

(5) Selecting suitable heaters:

Die design dictates cartridge heaters approximately 5 in. long by 1 in. in diameter. Choosing heaters 4.75 in. long by 0.933 in. in diameter of 450 w rating:

$$\therefore \frac{7.4\ (1000)}{45} = 16 \text{ heaters required}$$

Use brass sheathing with maximum safe operating temperature of 750° F

TABLE III

Calculations For Determining Necessary Heat Input to Operate Cast Aluminum Stretcher Die at 675° F

(1) Weight of cast aluminum die = 177.6 lb

(2) Kw-hr required to raise 177.6 lb of aluminum to 675° F

a—Aluminum watt-hour absorption per °F temperature rise = 12

∴ For ΔT (change in temperature) of (675°–75°) or 600° F required kw-hr input equals:

$$\frac{(600)\ (12)}{1000} = 7.2$$

b—Kw-hr input equals: (weight of die) (specific heat of aluminum) (ΔT) / 3412

$$\text{or } \frac{(177.6)\ (0.22)\ (600)}{3412} = 7.3$$

(3) Heat losses from uninsulated surface areas:

Uninsulated surface area = 6 sq ft

Watt-hour loss per sq ft = 400 (for aluminum)

$$\text{Total kw-hr loss} = \frac{(400)\ (6)}{1000} = 2.4$$

(4) Kw-hr required to attain die temperature of 675° F and operate at 675° F:

(2) 7.25
(3) 2.4
9.65

For safe operating margin add 10 pct

∴ 9.65 (1.10) = 10.6 kw-hr

(5) Selecting suitable heaters:

Die design dictates strip heaters approximately 20 in. long by 1.5 in. wide. Choosing 18.25-in. long heaters with wattage rating of 750:

$$\therefore \frac{10.6\ (1000)}{750} = 14 \text{ heaters required}$$

Use steel sheathing with maximum safe operating temperature of 1200° F

Effect of Heat Upon Residual Stresses

. . . Simple analyses are presented to illustrate the actions of expansion, contraction, and elastic and plastic deformations resulting from the heating and cooling of mild steel; also to illustrate the effects of these actions upon residual stresses and distortion. These actions and their effects are of significance in connection with such processes as welding, local stress relieving by any method involving heating, "flame straightening" to remove buckles or other distortion, preheating, postheating, local heating for bending or flanging, and any other operations involving local heating, particularly if it is applied over a considerable length of material or if it is of a continuous, progressive nature.

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By LA MOTTE GROVER

Welding Engineer,
Air Reduction Sales Co., New York

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SINCE progressive local heating of steel to a temperature substantially greater than 200° C. (about 400° F.) is shown to result in a residual stress of yield point intensity, all continuous welds have longitudinal residual stresses of such intensity. Research has confirmed this fact repeatedly during the last 10 years or more. However, experience as well as research indicate that these localized stresses do not reduce the safe load capacity of a structural plate or member.

Since the last pass or layer of a multi-pass weld heats the entire weld zone to a temperature above 200° C. (in thicknesses of metal encountered in most steel structures), the peening of previously deposited layers, or other methods of stress relief performed upon them, have little or no effect upon residual stresses. This does not necessarily mean that peening is ineffective in preventing cracking during welding. Cracking may result from temporary shrinkage stresses if the restraint against shrinkage is very severe.

If local heating is performed solely for the purpose of reducing residual stresses, the heating temperature must be controlled very carefully. When zones are heated on both sides of a weld for this purpose, an increase of 50 to 80° C. above the correct temperature will result in a wider zone of equally high residual stress, or result in buckling distortion, or both. As the width of the heated zone is increased, a local stress relieving process of the kind mentioned above becomes more effective in reducing residual stresses in the weld zone, because a greater internal "heat-jack" force is exerted.

In "flame straightening" operations to remove buckles from plating, as commonly practiced for several years, a local stress relieving action of the kind mentioned above has been involved in many cases, along with the action of local plastic upsetting and subsequent shrinkage during cooling. This cycle is commonly recognized. When buckling distortion is severe, flame straightening without the aid of maul and flatter, jacks or strongbacks is at the best very inefficient and in many cases virtually impossible.

Analogies and Assumptions

The first analysis, Fig. 1, involves three separate bars welded or otherwise firmly connected to rigid, nondeformable cross heads. It is quite similar to examples often used to illustrate the effects of expansion and contraction (see "Welding Handbook," 1942 Edition, published by the American Welding Society). In this case, however, the total cross-sectional area of the two restraining bars, *B-B*, is made four times that of the center bar *A*, and the deformations of all three bars are taken into consideration throughout a cycle of both heating and subsequent cooling.

In an actual panel of plating, the elements or strips of plating corresponding to the bars *A* and *B* are integral rather than separate. The shearing forces along the boundaries between the elements, together with the effect of the surrounding plate material in general, provide mutual restraint in lieu of the rigid cross heads shown in fig. 1. The stress gradients at these boundaries are not actually quite as steep as the infinitely great or vertical ones which are a counterpart of the separate bar analogy and the simplified stress distribution diagrams assumed for the further examples in this discussion, figs. 2, 3, 4 and 5. However, the actual stress gradients as measured in panels of plating have been found to be extremely steep. So the small errors in this regard involved in the following simplified analyses are not enough to affect greatly the magnitude of the results.

Although the results of the calculations presented have been confirmed thus far only in part by controlled experiments, their general agreement with observations of behavior in practical applications of various processes strengthens the validity of the conclusions summarized at the end of the article and those stated briefly here.

The conception employed in the

further examples of Figs. 2, 3, 4 and 5, involving plating, is that the behavior of rigid but movable "crossheads" (such as those marked *C* in Fig. 1), along with the elastic and plastic behavior of all the metal directly abreast of the progressively heated zone, to the right and left, is equivalent to the behavior of the actual plate material surrounding the heated area at any instant. To realize fully the assumed conditions of restraint and localized heating over a short length of plating, when the heating is actually progressive, and to maintain stability against buckling, the heating must be followed by a quenching stream or spray, in the same general manner as such quenching has been used commonly in flame straightening. This may seem like a rather rough approximation for determining the effective ratio of restraining area to heated area. However, enough correlation has been observed between actual stresses measured and those computed by means of this conception, that the approximation is thought to be close enough for all practical purposes when the heated band is continuous and the heating is progressive. When short intermittent lengths are heated, the effective restraint ratio is somewhat smaller than for continuous progressive heating.

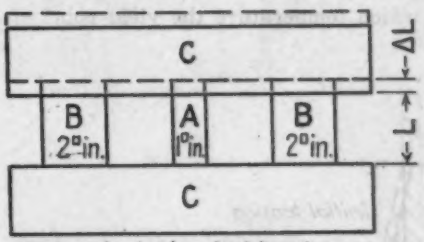
There is some lack of agreement in the data from research relative to the properties of mild or structural grades of carbon steel at elevated temperatures, and these properties vary with rate of strain and rate of cooling, but these differences do not seem to be great enough to alter the practical conclusions reached.

Method of Approach

The calculations that follow are all in the form of simple equations involving only one unknown and al- the the symbol Δ (delta) is used to express the mathematical conception of a small increment, the calculus is not used in solving any of these simple equations. In general, the method of approach is to calculate the expansion or contraction due to temperature changes, assuming a free member, and then to translate this potential expansion into a force, if fully restrained. Since full restraint never actually exists within an elastic system, this force is then modified, taking into account the relief of stress due to yielding of other members in the system. For the formulas that follow, the symbols are interpreted thus:

F = total force on any member
f = unit stress in a given member (designated by subscript)
Δf = change in unit stress due to unit elastic deformation, e
$e = \frac{\Delta L}{L}$ = unit increase or decrease in length as a result of combined thermal and restraining forces
E = modulus of elasticity

For the analyses that involve panels of plating, the yield point and elastic limit (for simplicity assumed to be the same stress) are taken as 44,000 lb. per sq. in. at 20 deg. C., the same value being used for both tension and compression. The yield point



A = 1 sq. inch (heated bar)
B = 2 sq. inches each
Restraint ratio = 4:1
Examples No. 1 and 2

FIG. 1—Examples 1 and 2 are applied to this simple elastic system, in which bar *A* is heated to 200° and 280° C respectively.

o o o

values at 100, 200, 300, 400 and 500 deg. C., respectively, are taken as 38,000, 32,000, 25,000, 18,000 and 12,000 lb. per sq. in.

The coefficient of expansion and contraction within the range from 20 to 200 deg. C. is taken as 0.067 x 10^{-4} per degree F. or 0.12 x 10^{-4} per degree C. Above 200 deg. C. the ultimate strength and modulus of elasticity, as well as the yield point, decrease and the coefficient of expansion increases rapidly. The yield points mentioned above are assumed as somewhat higher than those under uniaxial stress in a narrow bar, because of the biaxial nature of the stress in a comparatively wider plate.

The assumed physical properties of mild or structural grade steel at various temperatures are given in Table I for convenient reference. They are mostly mean values of those that have been found in reports of research. For convenience, the round number of 30 x 10^6 lb per sq in. is used for E, the modulus of elasticity, at 20 deg. C. (room temperature). The purpose in using the somewhat lower values of E for the higher temperatures involved in these analyses is mainly to draw attention to the fact that E does change. It would really be consistent to modify Δf during heating by a factor to reflect the effect of lowered modulus of elasticity in Examples 7 and 8, where Δf is contained in the terms f_A at time of maximum heating. However, the effect of this refinement upon the results of the calculations would be small.

Example 1, Heating to 200 deg. C.: First, bar *A*, Fig. 1, is assumed to be heated from 20 deg. to 200 deg. C. while bars *B* remain at 20 deg. C. If bar *A* were not restrained, the 180 deg. rise in temperature would cause it to elongate 180 x 0.12 x 10^{-4} x L or 0.00216 L, a unit deformation e of 0.00216 in. per in. Assuming that bar *A* were to be fully restrained from expansion, on the other hand, this deformation corresponds to an elastic stress of 27.8 x 10^6 x 0.00216 or 60,000 lb. per sq. in. (see Table I), if such an elastic stress were possible. The actual increase in length ΔL of the entire frame, however, causes a decrease in the compression stress in bar *A* and in the reaction tensile stresses in bars *B* that would exist if the frame were fully restrained from increasing in length.

At the point of maximum heating of bar *A* to 200 deg. C., if all three bars behaved elastically, the unit stresses in them would be:

$$f_A = -60{,}000 + \Delta f$$
$$f_B = \Delta f$$

Since the sum of the total stresses or forces involved must be 0 for equilibrium,

$$f_A + 4f_B = 0$$

Therefore, $-60{,}000 + \Delta f + 4\Delta f = 0$
and $\Delta f = 12{,}000$ lb. per sq. in.

(Tensile stresses are designated as positive and compression stresses are negative.) Therefore, f_A would be 48,000 lb. per sq. in. compression. This is greater than the yield point stress, so the solution assuming elastic behavior is incorrect.

Assuming a yield point of 32,000 lb. per sq. in. at 200 deg. C. at time of maximum heating (Table I) the unit stresses in the bars will be:

$$f_A = -32{,}000$$
$$f_B = \Delta f$$

The bar *A* would have to be of short length to sustain a yield point stress of 32,000 lb. per sq. in. compression without buckling; but in the prototype panel of plating that is heated in actual practice, the heating is progressive, and only a short length of "bar" or element is heated at one time.

For $\Sigma F = 0$
$-32{,}000 + 4\Delta f = 0$
and $\Delta f = 8{,}000 = f_B$

The elastic deformation corresponding to 32,000 lb. per sq. in. is about 0.0011 and that for $\Delta f = 0.0003$. The total unit expansion tendency of bar *A* during heating, 0.00216, must equal

the sum of the actual unit elongation that took place, 0.0003 ($\Delta L/L$), the suppressed unit elongation, 0.0011 (equal to the elastic deformation which corresponds to the yield point stress of 32,000 lb. per sq. in.), and the plastic deformation, e_p. Therefore:

$0.00216 = 0.0003 + 0.0011 + e_p$

$e_p = 0.0022 - 0.0011 - 0.0003$

$= 0.0008$ in. per in.

This plastic deformation is so small that it would not result in any increase of stress beyond the yield point stress (along the stress-strain curve toward the ultimate strength).

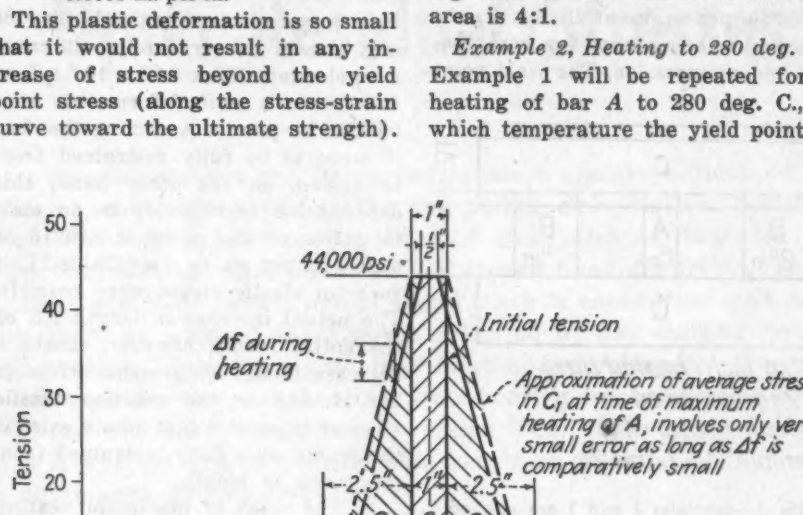


FIG. 2—Graphical analysis worked out for examples 3 and 4 in the text. The condition would correspond to heating near the weld zone in plating.

So the assumption of no greater than yield point stress in bar A is logical.

Now in considering what happens upon the cooling of bar A back to 20 deg. C., ΔL becomes a decrease in actual length. In cooling through 180 deg. bar A tends to contract an amount which would cause an elastic unit tensile stress of 64,800 lb. per sq. in. ($0.00216 \times 30 \times 10^6$); but this is reduced by its previously acquired compression stress and also by the actual shortening, ΔL of the entire frame during cooling. In this part of the calculations, Δf will be used to represent the elastic stress corresponding to the deformation $\Delta L/L$ which occurs during cooling. After cooling:

$f_A = 64{,}800 - 32{,}000 - \Delta f$

$f_B = 8{,}000 - \Delta f$

$\Sigma F = 0$, so $f_A + 4f_B = 0$

$64{,}800 - 32{,}000 - \Delta f + 32{,}000 - 4\Delta f = 0$

$\Delta f = 12{,}960$ lb. per sq. in.

$f_A = 19{,}840$ and $f_B = -4960$ lb. per sq. in.

The above calculations have been presented for the sake of providing a simple example to acquaint the reader with the conventional method of calculation. They also demonstrate that even though some plastic upsetting of bar A occurred during heating, its final tensile stress after cooling again is very much below yield point intensity when the heating is to 200 deg. C. and the ratio of restraining area to the heated and cooled area is 4:1.

Example 2, Heating to 280 deg. C.: Example 1 will be repeated for a heating of bar A to 280 deg. C., at which temperature the yield point of the mild steel has been reduced to about 26,000 lb .per sq. in. (Table I).

At time of maximum heating:

$f_A = -26{,}000$

$f_B = \Delta f = 6500$ lb. per sq. in.

In cooling through 260 deg. back to 20 deg. C., bar A tends to contract 0.00317L. The corresponding elastic stress is 95,000 lb. per sq. in.* (See Table I); but this is reduced, as in previous example, by the previously acquired compression stress and by the actual shortening ΔL of the entire frame during cooling; also by any plastic deformation that occurs during cooling. Here again Δf equals the stress corresponding to $e = \Delta L/L$.

If no plastic deformation occurred, the stresses after cooling would be:

$f_A = 95{,}000 - 26{,}000 - \Delta f$

$f_B = 6500 - \Delta f$

$\Sigma F = 0$

$95{,}000 - 26{,}000 - \Delta f + 26{,}000 - 4\Delta f = 0$

$\Delta f = 19{,}000$ lb. per sq. in.

$f_A = 50{,}000$

$f_B = 12{,}500$

Since 50,000 lb. per sq. in. is well above the assumed yield point at 20 deg. C., plastic deformation occurred during cooling, and after cooling f_A must have equalled 44,000 lb. per sq. in. and f_B 11,000 lb. in reality.

It is obvious that if the heating had been carried beyond 280 deg. C. the final stresses in A and B after cooling would have been the same. The only difference would be that more plastic stretch of bar A would take place during cooling. If the ratio of the area of the restraining bars B to that of bar A were increased, heating of bar A to a temperature of even less than 280 deg. C. would have resulted in plastic stretching in A during cooling, as computations similar to these would indicate.

The conditions of restraint around a heated band or strip in a large area of plating in any practical application of such heating for removing distortion or reduction of residual stresses, are nearly always more severe than the 4:1 ratio assumed. Therefore, it appears that heating to more than 280 deg. C. for such purposes is useless, unless there is quite an appreciable amount of actual slack material at buckles in the plating that is to be worked out by some special means, such as by jacks or with maul and flatter, while the heated area is hot and plastic, thus forcing an extra plastic upsetting that will not be lost by subsequent plastic stretching during cooling.

Mild steel becomes so weak because of lowered yield point and the phenomenon of creep at temperatures above 500 or 600 deg. C. (a dark cherry or blood red color) that it cannot sustain appreciable stress. When the heating is above that temperature, regardless of conditions of restraint, any additional plastic upsetting caused by the increase in temperature will always be cancelled by a corresponding plastic stretching during cooling. In fact, computations for other ratios of restraint to heated area, which are made further on in this article, indicate that plastic restretch during cooling occurs in any practical case when the temperature of heating is much lower than 500 deg. C.

Example 3 and 4, Heating Near Weld Zone in Plating: The same method of calculation may be applied to the more complex case of

To be strictly correct, a stress slightly lower than 95,000 lb. per sq. in. should be used here; but in cooling from only 280 deg. C., when the initial stress is the yield point in compression, most of the plastic stretch occurs during the latter stages of cooling, even under full restraint.

applying heat to zones of a panel of plating on either side of a welded joint or connection for the purpose of correcting distortion by flame straightening or for the sake of reducing the magnitude of the longitudinal stresses in the weld zone. Such a panel of plating with a weld zone along its center line is shown diagrammatically in Fig. 2. This weld zone includes not only the weld itself but also the adjacent base metal which has been heated during welding to a temperature high enough that it is subjected to residual longitudinal tension after cooling. The weld might be a pair of fillet welds connecting a stiffener or a beam to the plating; it might be simply a bead weld or a pair of bead welds deposited opposite each other on the two surfaces of the plating, or it might be a butt welded joint. On each side of the weld zone there are regions of residual compression stress balancing the residual tension stress in the weld zone. If there is a beam or stiffener connected to the plating, it constitutes more restraint, such as areas B, C_1 and C_2 do, while areas A are heated and cooled.

Although the stresses have been blocked into rectangular, triangular and trapezoidal areas for convenience of computation, the stress gradients are very steep in reality between the weld zone and the adjacent areas of plating. Also, it will be noticed that in practical cases, during heating, plastic deformation always occurs in the heated zone of original compression stress, and so this original compression stress does not affect the calculations. Obviously, the distribution of the original compression stress on either side of the weld zone makes very little difference in the practical cases analyzed.

Therefore no large error will result from treating each of the areas A, B, C_1, and C_2 as an independent bar fastened to a rigid crosshead, after the fashion of the previous examples. Since the heating progresses gradually along the plate and there is a comparatively short length heated at one time, the condition of restraint is not unlike that of the rigid crossheads used in the previous examples.

The total width of plating is assumed as 72 in. The heated zones A total 8 in. in width (4 in. on each side of the weld zone). The areas B, C_1 and C_2 are restraining areas during heating. They total 64 in. in width. The ratio of restraining width to heated width is therefore 8:1, as compared with a ratio of restraint of 4:1 in the previous examples. Unit thickness is assumed for the plating, merely to simplify calculations. The

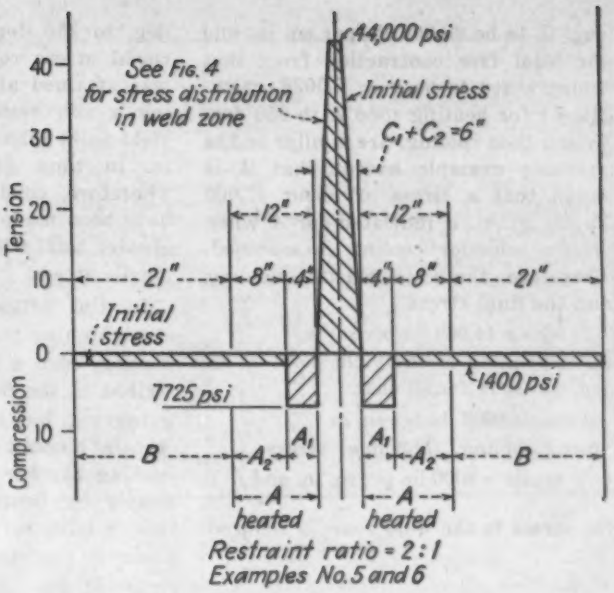


FIG. 3—Graphical analysis worked out for examples 5 and 6 where wider bands of plating are heated than in examples 3 and 4.

results of the calculations are independent of the thickness assumed.

As before, Δf will be used to represent the elastic stress corresponding to the actual increase in length of the entire width of plate during heating, or its decrease in length during cooling, as the case may be.

The zones A will be heated to 200 deg. C. at which temperature the yield point of 32,000 lb. per sq. in. will be exceeded (as may be ascertained by calculation). All other parts of the plating are first assumed to be held at 20 deg. C. At time of maximum heating:

$f_A = -32{,}000$

$f_B = \Delta f - 1400$

Av. $f_{c_1} = \Delta f + 22{,}000$

$f_{c_2} = 44{,}000$

$\Sigma F = 0$

$8f_A + 58f_B + 5f_{c_1} + f_{c_2} = 0$

$-256{,}000 + 58\Delta f - 81{,}200 + 5\Delta f + 110{,}000 + 44{,}000 = 0$

and $\Delta f = 2900$ lb. per sq. in.

$f_A = -32{,}000$

$f_B = 1500$

Av. $f_{c_1} = 24{,}900$

During cooling zone A tends to contract by an amount, $e = 0.00216$ corresponding to an elastic stress of 64,8000 lb. per sq. in. under full restraint. After cooling:

$f_A = 64{,}800 - \Delta f - 32{,}000$

$f_B = 1500 - \Delta f$

Av. $f_{c_1} = 24{,}900 - \Delta f$; $f_{c_2} = 44{,}000 - \Delta f$

$\Sigma F = 0$

$262{,}400 - 8\Delta f + 87{,}000 - 58\Delta f + 124{,}500 - 5\Delta f + 44{,}000 - \Delta f = 0$

$\Delta f = 7200$ lb. per sq. in.

$f_A = 25{,}600$

$f_B = -5700$

Av. $f_{c_1} = 17{,}700$

$f_{c_2} = 36{,}800$

Assuming the yield point at 250

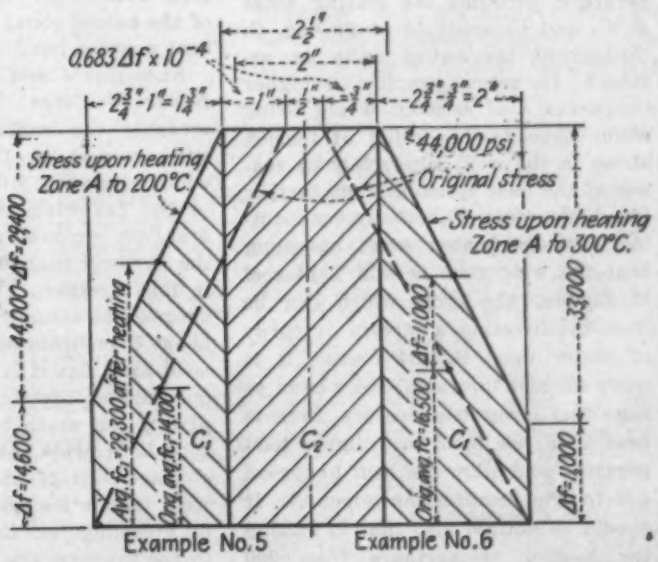


FIG. 4—Stress distribution in the weld zone of Examples 5 and 6. (See also Fig. 3.)

deg. C. to be 28,000 lb. per sq. in. and the total free contraction from that temperature to be $e = 0.0028$, calculations for heating zone A to 250 deg. C. and then cooling, are similar to the previous example except that it is found that a stress of about 47,000 lb. per sq. in. is indicated for A when elastic behavior cooling is assumed. Therefore there is plastic yielding and the final stress

f_A equals 44,000 lb. per sq. in.

corresponding to the yield point at 20 deg. C. It is found that

Δf equals 9000 lb. per sq. in.

during cooling. The final stress

f_B equals −8000 lb. per sq. in. and f_{C_2},

the stress in the weld zone, is reduced a little further, to 35,000 lb. per sq. in. as compared with 36,800 lb. for heating to 200 deg. C. and cooling.

Since plastic stretch occurred during cooling from the heating to 250 deg. C., the final stresses in the weld zone and the plating would be the same, maintaining a restraint ratio of 8:1, even though the heating of zone A were carried to a higher temperature, provided the plating zones B, C_1 and C_2 are held at 20 deg. C. throughout the entire cycle as assumed. In actual practice, a higher temperature of heating would bring about some further relief of tension stress in the weld zone solely by reason of the heat spreading out further into plate zones B, actually constituting a wider heated zone; assuming that the weld zone is still kept cool throughout the cycle which can be done by directing a stream or spray of water upon it. Of course, it is more efficient to heat a wider band or zone to a lower temperature, than to heat a narrow band to a higher temperature and allow the heat to spread out in the compression zones B. It should be noticed also that in raising the heating tempertaure from 200 deg. to 250 deg. C., the small additional stress relief in the weld zone was attained at the expense of leaving a new residual tensile stress of yield point intensity, 44,000 lb. per sq. in. in zone A which was heated. Therefore, conditions would seem to have been made worse because of the greater total width of higher residual tensile stress.

In the actual practice of flame straightening to remove buckles from plating, such a limitation as that described in the first part of the above paragraph has been noticed. After a certain amount of heat application, nothing further can be accomplished merely by heating. In referring to this condition, workmen sometimes say that "the life has gone out of the plating."

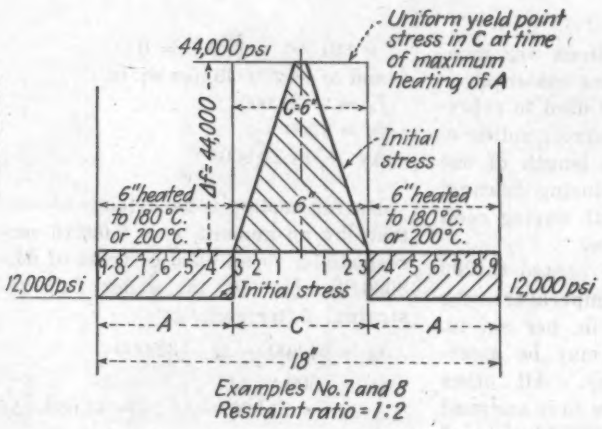


FIG. 5—Graphical analysis for examples 7 and 8 in which complete stress relief is obtained.

From the results of the previous example, it is obvious that the only way to bring about a further reduction of residual stress in the weld zone, and at the same time to prevent the creating of new zones of high residual tension stress, is simply to reduce the ratio of the restraining zone width with respect to the width of the heated zone; in other words, to heat a wider band or zone A.

Examples 5 and 6, Heating Wider Bands of Zones: The effect of increasing the width of heated zone with respect to the total effective width of plating will be demonstrated in the following two examples. The first one probably represents about the furthest that it is practical to go in this direction, Fig. 3. The heat is assumed as actually applied to a band about 8 in. wide on each side of the weld zone, but it is allowed to spread out further toward the edges of the plating, so as to be equivalent to a zone 12 in. wide heated to 200 deg. C., on each side of the weld zone. The weld zone is maintained at 20 deg. C. by a cooling jet. Calculations similar to the previous one are carried out.

The 12-in. heated zone may be divided in A_1 (with an initial compression stress of 7725 lb. per sq. in.) and A_2 (within the zone which has an initial compression stress of 1400 lb. per sq. in.). However, since A_1 and A_2 both reach the yield point stress of 32,000 lb. per sq. in. at 200 deg. C., they can be treated as one area A, of a 24-in. width. The ratio of total restraining areas during heating $(B + C_1 + C_2)$ to the heated areas $(A_1 + A_2)$ is 48:24 or 2:1.

The calculations for Example 5 are similar to previous ones, except that a further refinement is introduced in determining the widths of zones C_1 and C_2 as shown on the left side of Fig. 4. This refinement was thought to be advisable because of the greater values of Δf during heating in this case, although calculations show that the indicated final residual stresses after cooling are almost exactly the same, whether or not this refinement is introduced. This further substantiates the assumption that the approximations introduced into the stress distribution diagrams, to simplify all these analyses, have very little effect upon the accuracy of the results.

Heating zone A to 200 deg. C. produces a yield point compression stress in that zone; so

f_A equals −32,000 lb. per sq. in.

Trial calculations show that Δf during heating is about 14,600 lb. per sq. in and therefore the width of zone C_2 (Fig. 4) is $2 \times 0.683\ \Delta f \times 10^{-4} + 0.5 = 2.5$ in., leaving a 3.5-in. total width for the two C_1 zones at time of maximum heating of zones A to 200 deg. C. At the time of maximum heating:

$$f_A = -32{,}000$$
$$f_B = \Delta f - 1400$$
$$f_{C_1} = \Delta f + 14{,}700 \text{ (average)}$$

and $f_{C_2} = 44{,}000$ lb. per sq. in.

Since $\Sigma F = 0$,

$$24f_A + 42f_B + 3.5f_{C_1} + 2.5f_{C_2} = 0$$
$$-768{,}000 + 42\Delta f - 58{,}800 + 3.5\Delta f + 51{,}500 + 110{,}000 = 0$$
$$\Delta f = \frac{665{,}300}{45.5} = 14{,}600 \text{ lb. per sq. in.}$$
$$f_A = -32{,}000$$
$$f_B = 13{,}200$$
$$f_{C_1} = 29{,}300$$
$$f_{C_2} = 44{,}000$$

After cooling back to 20 deg. C:

$$f_A = 64{,}800 - 32{,}000 - \Delta f = 32{,}800 - \Delta f$$
$$f_B = 13{,}200 - \Delta f$$
$$f_{C_1} = 29{,}300 - \Delta f$$
$$f_{C_2} = 44{,}000 - \Delta f.$$
$$EF = 0$$
$$24(32800 - \Delta f) + 42(13200 - \Delta f)$$

$$+3.5(29300-\Delta)+2.5(44000-\Delta f)=0$$
$$787{,}000-24\Delta+554{,}400-42\Delta f+102{,}500$$
$$-3.5\Delta f+110{,}000-2.5\Delta f=0$$
$$\Delta f=\frac{1{,}554{,}000}{72}=21{,}600 \text{ lb. per sq. in.}$$
$$f_A=11{,}200$$
$$f_B=-8400$$
$$f_{C_1}=7700 \text{ (average)}$$
$$f_{C_2}=22{,}400$$

The peak residual tensile stress in the weld zone has been cut virtually in half, from 44,000 lb. per sq. in. to 22,400 lb. per sq. in., and the residual stresses left in the heated zone and in the *B*-zones are comparatively low, 11,200 lb. per sq. in. tension and 8400 lb. per sq. in. compression, respectively. In the following Example 6, it will be shown that although heating zones *A* to a higher temperature such as 300 deg. C. will reduce the residual tension stress further in the weld zone, it will leave the panel of plating as a whole in a less desirable condition with respect to buckling distortion or residual tension stress, even though the ratio of restraining area to heated area is only 2:1.

For this next example, the same panel of plating and the same original residual stresses are used (Fig. 3), and the distribution of stresses in the weld zone during the heating of zones *A* is shown on the right side of Fig. 4. By trial calculations the heating temperature, 300 deg. C., is chosen as the temperature sufficient to barely start plastic deformation of zone *A* during subsequent cooling. As demonstrated previously, once this is accomplished, further heating (that is, heating to a still higher temperature within the same zone widths) does not change the resulting final stresses in the panel after cooling, because additional plastic stretch in cooling is the only result.

The yield point at 300 deg. C. has been assumed as 25,000 lb. per sq. in. (Table I). Trial calculations show

TABLE I

Elastic Stress Due to Expansion or Contraction at Various Temperature Ranges

1	2	3	4	5	6	7
Range of Temp. in Heating or Cooling Deg. C.	Yield Point at Upper Temp. of Range	Coefficient of Expansion Multiplied by Degrees of Temp. Range	Cumulative Coefficient of Exp. or Contr. from 20° C. to Upper Temperature Σ's of Col. 3	Modulus of Elasticity at Upper Temperature x 10^6	Elastic Stress at Upper Temp. Corresponding to Exp. or Contr. Coefficients Col. 4 x Col. 5	Elastic Stress at 20° C. Corresponding to Cumulative Exp. or Contr. Coefficients Col. 4 x 30 x 10^6
20	44,000	.....	.....	30	.....	.....
20 to 100	38,000	0.00096	0.00096	29	27,800	28,800
100 to 180	33,000	0.00097	0.00193	28	54,000	57,900
180 to 200	32,000	0.00023	0.00216	27.8	60,000	64,800
200 to 250	28,000	0.00063	0.00279	27	75,300	83,700
250 to 280	26,000	0.00038	0.00317	26.5	84,000	95,000
280 to 300	25,000	0.00026	0.00343	26.2	90,000	102,900
300 to 400	18,000	0.00135	0.00478	23.9	114,000	143,400
400 to 500	12,000	0.00142	0.00620	21	130,000	186,000
500 to 600	5,000	0.00150	0.00770	.....	.....	.....

that Δf during heating is about 11,000 lb. per sq. in., and therefore the width of zone C_2 is

$$2\times 0.683\times 10^{-4}\times 11{,}000+0.5=2.0 \text{ in.}$$

leaving a combined width of 4 in. for the two C_1 zones at the time of the maximum heating of zones *A*. (See Fig. 4, right.) Calculations similar to those of the preceding example show that at the time of maximum heating,

$$f_A=-25{,}000$$
$$f_B=9600$$
$$f_{C_1}=27{,}500 \text{ (average)}$$
$$f_{C_2}=44{,}000 \text{ lb. per sq. in.}$$

In cooling through the 280 deg. from 300 deg. to 20 deg. C., zone *A* tends to shrink through a deformation of $e=0.00343$ in. which corresponds to an elastic stress of 102,900 lb. per sq. in. under complete restraint.

After cooling:

$$f_A=102{,}900-25{,}000-\Delta f$$
$$f_B=9600-\Delta f$$
$$f_{C_1}=27{,}500-\Delta f \text{ (average) and}$$
$$f_{C_2}=44{,}000-\Delta f$$
$$\Sigma F=0$$
$$24f_A+42f_B+4f_{C_1}+2f_{C_2}=0.$$

$\Delta f=34{,}300$ during cooling.

$f_A=43{,}600$ (virtually the yield point)

$f_B=-24{,}700$

$f_{C_1}=-6800$ (average) and

$f_{C_2}=9700$ lb. per sq. in.

Although a further very substantial reduction of the peak residual stress in the weld zone has been accomplished by raising the temperature of heating of zone *A* to 300 deg. C., this has been done at the expense of leaving the plating with an even broader zone (zones *A*) of residual tension stress of yield point intensity, so nothing has been gained. In reality the results indicated by the calculations for this last example could not be realized, anyway, because the indicated final compression stress of nearly 25,000 lb. per sq. in. in zones *B* would cause buckling, even in fairly heavy plating, by reason of the fact that this final high stress exists over a very considerable length and width of plate area. In the case of comparatively high temporary compression stresses indicated at the time of maximum heating in zone A_1 for this example and preceding examples, such stresses could probably be sustained because of their local nature.

TABLE II

Summary of Computed Stresses for the Eight Examples Given in the Text

Example No.	Ratio Restr't to Heating Zone	Fig. No.	Temperature of Heating Zone A Deg C	Initial Residual Stress f_A	Initial Residual Stress f_B	Initial Residual Stress f_{C_2}	Δf during heating	Stress at time of Max. Heat f_A	Stress at time of Max. Heat f_B	Stress at time of Max. Heat f_{C_2}	Δf during cooling	Final Stress after Cooling f_A	Final Stress after Cooling f_B	Final Stress after Cooling f_{C_2}	Example No.
1	4:1	1	200	0	0	.....	8,000	−32,000	8,000	.....	12,960	19,840	−4,960	.....	1
2	4:1	1	280	0	0	.....	8,500	−26,000	8,500	.....	17,500	44,000	−11,000	.....	2
3	8:1	2	200	−7,725	−1,400	44,000	2,900	−32,000	1,500	44,000	7,200	25,600	−5,700	36,900	3
4	8:1	2	250	−7,725	−1,400	44,000	2,400	−28,000	1,000	44,000	9,000	44,000	−9,000	35,000	4
5	2:1	3 & 3a	200	−7,725	−1,400	44,000	14,600	−32,000	13,200	44,000	21,900	11,200	−8,400	22,400	5
6	2:1	3 & 3a	300	−7,725	−1,400	44,000	11,000	−25,000	9,600	44,000	34,300	43,600	−24,700*	9,700	6
7	1:2	4	180	−12,000	.....	44,000	44,000	−22,000	.....	44,000	38,600	−2,700	.....	5,400	7
8	1:2	4	200+	−12,000	.....	44,000	44,000	−22,000	.....	44,000	44,000	0	.....	0	8

* Plate would not withstand a wide-spread compression stress this great.

Since the heating is progressive, only a short length of zone A, over a comparatively narrow width, is subjected to the rather high compression stress at any instant.

Examples 7 and 8—A Special Case of Complete Stress Relief, Seldom Encountered in Practice: For the two final examples, the ratio of restraining zone to heated zone is reduced to 1:2, Fig. 5. This ratio would be encountered very seldom in actual practice. A plate 18 in. wide is heated for the full widths of the initial residual compression zones, a 6-in. width along each plate edge being heated. The weld zone of 6-in. width down the center of the plate is assumed to be kept at 20 deg. C. by a water jet or spray. Trial calculations show that the heating of zones A to 180 deg. C. will produce a $\triangle f$ of 44,000 lb. per sq. in., thus bringing the full width of the 6-in. weld zone C to a uniform tensile stress of yield point intensity at the time of maximum heating of zones A. This can be established as follows: The heating from 20 deg. to 180 deg. C. tends to cause a deformation $e = 0.00193$ in zones A, which corresponds to an equivalent elastic stress of $28 \times 10^6 \times 0.00193 = 54{,}000$ lb. per sq. in. At time of maximum heating:

$$*f_A = -54{,}000 - 12{,}000 + \Delta F$$
$$= -66{,}000 + \Delta f$$
$$f_C = 44{,}000 \text{ lb. per sq. in.}$$

**See introductory paragraphs for discussion of effect of lowered modulus of elasticity upon $\triangle f$ in expression for f_A at time of maximum heating.*

Since $\Sigma F = 0$, $12f_A + 6f_C = 0$

$$-792{,}000 + 12\Delta f + 264{,}000 = 0$$
$$\Delta f = 44{,}000 \text{ lb. per sq. in.}$$
$$f_A = -22{,}000$$

Since the final stresses after cooling exist at 20 deg. C., the elastic stress corresponding to the contraction tendency during cooling is $30 \times 10^6 \times 0.00193 = 57900$ lb. per sq. in. (No plastic deformation occurs in zone A in this case). After cooling,

$$f_A = 57{,}900 - 22{,}000 - \Delta f$$
$$f_C = 44{,}000 - \Delta f$$
$$12f_A + 6f_C = 0$$
$$430{,}800 - 12\Delta f + 264{,}000 - 6\Delta f = 0$$
$$\Delta f = 38{,}600 \text{ lb. per sq. in.}$$
$$f_A = -2700 \text{ and } f_C = 5400$$

Heating zones A to a higher temperature will not alter the results of the calculations for stresses at the time of maximum heating, because all of zone C reaches yield point stress when zones A are heated to 180 deg. C., and there is no zone B to add to the restraint in this case. However, raising the heating temperature to slightly more than 200 deg. C. does affect the final stresses, because the zones A tend to contract about $0.0022L$ which corresponds to an elastic stress of 66,000 lb. per sq. in. After cooling:

$$f_A = 66{,}000 - 22{,}000 - \Delta f = 44{,}000 - \Delta f$$
$$f_C = 44{,}000 - \Delta f$$
$$12f_A - 6f_C = 0$$
$$528{,}000 - 12\Delta f + 264{,}000 - 6\Delta f = 0$$
$$\Delta f = 44{,}000 \text{ lb. per sq. in.}$$
$$f_A = 0 \text{ and } f_B = 0 \text{ (complete stress relief).}$$

In all these examples the temperature distribution has been assumed as uniform across the thickness of the plating. When the heating is rapid, and especially if the plating is comparatively thick, the higher temperature reached on one surface of the plating causes the metal on that surface to shrink more in cooling. This exerts a bending action which assists in the removal of buckles from distorted plating, provided the heating is done from the convex side of the buckle. In thin plating, the heat distribution throughout the thickness is so nearly uniform that little bending action of this kind takes place, and very little general shortening can take place as a result of temporary temperature gradients across the thickness.

Conclusions

For convenience in comparison, the results of the calculations for all of the examples are given in Table II.

In view of the fact that the actual condition of restraint may not be quite as great as that involved in the rigid crosshead analogy that has been used, the temperatures actually required in practice to produce the effects assumed in the calculations might be slightly greater, but the error is probably so small as to have no practical significance. The general conclusions that are indicated by the calculations are summarized in the following paragraphs:

(1) In all of the practical cases of local stress relieving that have been analyzed, heating to a temperature substantially greater than 200 deg. C. (about 400 deg. F.) leaves the plating with more extensive high residual stresses than in the welded condition (and the examples cover a wide range of ratios of restraining area to heated area).

(2) If the heating is being done solely for the purpose of reducing residual tensile stresses (prompted by the thought that they may be objectionable *per se*) very careful control of the temperatures of heating seems advisable, because an increase of from 50 to 80 deg. C. above the correct temperature will result in the creating of new zones of wider extent and just as high residual tensile stresses, or result in the buckling of the plating, or possibly both.

(3) In all cases representing ratios of restraining area to heated area that are likely to be encountered in actual practice, a heating to 200 deg. C. is sufficient to cause plastic deformation in the heated zone during the heating, and the initial residual stress in that zone does not affect the behavior, except as it exerts a comparative small influence upon the initial stress distribution in other zones. Since the conditions of restraint against shrinkage during cooling are considerably less than full restraint, the occurrence of plastic upsetting during the heating of an area is not necessarily followed by a high residual tensile stress in that area after it has cooled. However, not much of a further increase in the heating temperature is required to result in such high final residual tensile stresses.

The shrinkage of the heated zone during its cooling, after it has been upset, is a very important part contributing to the local stress relieving effect in the weld zone.

(4) Heating beyond the point where plastic deformation starts in the heated zone (which is approximately 200 deg. C.), cannot increase the "internal heat-jack effect." As a matter of fact this effect is reduced because of the lower yield point at the higher temperature. However, the greater shrinkage of the heated zone in cooling from the higher temperature, effects a further reduction of the residual tension stress in the weld zone, up to the point, not far above 200 deg. C., where the temperature and resulting shrinkage are sufficient to cause plastic stretching in the heated zone during cooling. At this point, however, the general residual stress conditions throughout the plating are worse than when the heating is to only 200 deg. C. Heating still further does not alter the results in any way, unless buckling has started in the restraining zones of the plating, in which case it would become worse if the heating temperature were raised further. If buckling does not occur, the still further heating merely results in that much more plastic stretching of the heated zones during the subsequent cooling, with no further effect upon the final residual stresses.

(5) As the width of heated zone is increased (that is, the ratio of restraining area to heated area decreases), the process is more effective in reducing residual tensile stresses in the weld zone, because the heating exerts more "internal jacking force." Also the minimum heating temper-

ature that results in plastic stretching of the heated zone during cooling, becomes greater as the width of heated zone becomes relatively wider. Therefore, comparatively narrow heated bands or zones are ineffective in the relief of residual stresses in the weld zone and they may set up new zones of high residual tensile stress.

(6) When an area is heated to no more than 300 deg. C., and it starts its cooling with an initial compression stress of yield point magnitude, even though there is full restraint against shrinkage, very little plastic stretching occurs during the cooling until the temperature has dropped to about 100 deg. C. In cooling from higher temperatures such as 500 deg. C. or 600 deg. C., under full restraint, plastic stretching occurs continuously during most of the cooling cycle. In this case the lower initial compression stress is reversed to tension during the early stages of cooling, and as the metal cools, it has a tension stress at any instant equal to the yield point value corresponding to the temperature of the metal at that instant.

(7) If deformations causing distortion are small (of the same order as elastic deformations), the distortion can be corrected simply by heating and cooling as described in the examples presented. Since the actual linear deformations necessary to cause appreciable buckling of light plating are quite small, a good bit of the minor distortion encountered in plating is in this class.

(8) When buckling distortion is extreme, a condition has existed during cooling after welding, similar to that described near the end of conclusion No. 4 above. The linear deformations are considerably greater and there is more slack to be removed. The removing of such buckles without the aid of maul and flatter, jacks or strongbacks to exert additional forging or upsetting forces is surely at the best a very costly and inefficient method, and in many cases impossible.

Experience shows that if the buckles are moderately severe and the panel of plating is restrained along all four boundaries, the buckles can be removed in some cases by an extensive application of spot heating, covering almost the entire area of the plating, as the heating operator works from regions near the stiffeners toward the center of the buckle. This gradually builds up shrinkage forces in all directions. When such extensive heating is required, it seems to be an indication that the use of maul and flatter, jacks or strongbacks would have accomplished the results at much less cost and more quickly.

(9) It would seem that when the plating is stiffened temporarily at the buckles by such auxiliary means as have been mentioned, the heating can well be less localized, because extra surrounding heat at the buckles should furnish further contraction, after the upset center of the heated spot has been quenched to raise its yield point.

(10) When the ratio of restraining area to heated area is 8:1, all metal heated to a temperature of approximately 250 deg. C. or more, by either continuous, localized, progressive heating or by continuous, progressive welding, will contain longitudinal residual tension stresses of yield point magnitude (average throughout the thickness). If the restraint ratio is greater than 8:1, which is often the case in practice, the heating temperature necessary to result in residual stresses of such magnitude is even somewhat less. When the restraint ratio is as small at 2:1, the significant heating temperature is only about 300 deg. C.

From the above, it is evident that if an incompleted weld is stress relieved in some manner and then a further substantial pass of welding is deposited so that the previously existing weld zone is all heated to at least 250 deg. to 300 deg. C., then the residual stresses in the weld zone will be approximately the same as though the intermediate stress relieving had not been performed.

It is hoped that the analyses presented will help to provide a better understanding of the actions of expansion and contraction in causing initial residual stresses and distortion as well as their actions during the heating and cooling of flame straightening work, local stress relieving, and other operations involving heating and cooling.

Influence of Heat-Treatment on Damping Capacity

An investigation of the damping capacity, primarily of light alloys, resulted in the development of an experimental method which, it was felt, might provide information of value in respect to steel. The method, described by Leopold Frommer and A. Murray, is the subject of a paper on "Influence of the Heat-Treatment of Steel on the Damping Capacity at Low Stresses," submitted to the British Iron and Steel Institute, and is a development of that employed by other investigators. It is characterized by a limitation of the amplitude of a resonance vibration of a freely-suspended specimen, so that the surface shear stress never exceeds 90 psi for which, within the limits of experimental error, the damping capacity is independent of such stress variation as may come up to this limit.

An electromagnetic method of inducing torsional oscillations in freely-suspended cylindrical steel bars was used by the authors for measurements of the damping capacity up to a maximum stress of 100 lb psi. There were six specimens, each 3 in. diam. and 3 ft long, all from the same melt, with a composition normal to a 0.6 pct carbon steel. Measurements were made in the normalized 1526° F, oil-quenched and the fully-tempered conditions; by successive heat treatment these conditions were repeated. The measurements showed that the damping value was a characteristic property which varied for each condition and was reproduced through two heat-treatment cycles. Within the experimental accuracy the torsional damping capacity is independent of oscillation frequency up to 7000 cycles per sec and of stresses up to 100 psi. The damping values as expressed by the logarithmic decrement are 0.5×10^4 for the tempered condition, and 0.7×10^4 for the oil-quenched condition. The Brinell hardness values showed changes similar to these, and it is suggested that this correspondence is due to the state of aggregation of the carbide, resulting from the heat treatment given.

Precision Founding

. . . . In this sixth of a series of articles on the theory and practice of precision casting, the author continues his discussion on the making of matrices and describes the modeling of waxes, plaster carving and production sequences in casting.

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IN general, the design of a matrix is a matter of experience and its making is one of skill. These are two qualifications subject to natural limitations when it comes to explaining the affair on paper. The same could be said of precision founding as a whole. At the same time, intricate matrices have been made and brought to a functioning stage and precision founding has been carried on for a good many years by means of no better an agent than common sense.

As to metal matrices, a few additional compass comments may be of help. One of these would be a clear visualization of a proposition under consideration. The design of a matrix is arrived at in the speediest and surest manner when first plastecine or, better still, impressions of a hard modeling compound are taken from sectional parts of the master pattern. The particular compound suitable for such work will be examined in a moment.

Then there would be the jaws of the matrix, that is its various parts coming together without a visible joint between them. The surfaces here must be true and square and finished with precision. They should, further, have hardened pilot pins and hardened bushings set into these surfaces to insure accurate matching. From opening and closing the fixture, the matrix may lose its accuracy through wear and should therefore not be depended upon. A matrix must always close with precision so that it will not foul and that the pattern formed will stay accurate and have no unnecessary seams and fins.

Gates should be an integral part of the pattern matrix whenever this can be done without the design resulting in an apparatus so complicated it defeats its purpose, that of saving time and labor. But as has been shown in a design as simple as that of the 3-in. ring, gates integral with the pattern are liable to complicate matrix design and render it expensive beyond all possible returns. There is another thing to bear in mind—if for any unforeseen cause the number of gates allotted to a pattern should, under actual production, prove either inadequate or to be too many. Only the gate-matrix would be lost if it has been made as a separate unit. In general, as a starter, it pays to make the gate matrix as cheaply as possible and let the main issue, production, demonstrate its own needs.

In the case of the 3-in. ring gating, requirements would announce themselves in an actual run of the castings, by not filling the mold speedily enough, or by too violent an injection of hot metal—dull edges or bulging or other distortion. It will perhaps be remembered that sharp edges were wanted together with perfectly parallel sides. Such manifestations of error, as pointed out earlier, may of course also be due to spinning speeds, temperature of the metal, insufficient or wrongly placed venting and so forth. In any case, the basic concept is to get production under way once the master pattern has been arrived at and its matrix made, then leave the rest up to an actual showdown. For, with the dimensions and other requirements of the master pattern established, the balance is after all a mere matter of adjustments and trimming and this, as was said a moment ago, will just have to be left to past experience and some degree of ingenuity.

In the preceding chapter the gate-matrix for the 3-in. ring was left to be made in rubber. While that is the thing to do for a long-lasting job, proper when all bugs have been eliminated, at the start it would be a lot simpler to make that gate-matrix in plaster. By the time the repeated pourings of hot wax have begun to flake the plaster and thus have begun to affect the correct size of the gates, it will be pretty well known just how many gates and of what size the castings actually need to be. Then it would be time enough to make rubber matrices for the gates. Since a detailed discussion of such countless, and often unguessable, contingencies would fill a volume by themselves, and it is obvious that a categorical classification and description of them would be both tedious and confusing and in their totality convey the impression that precision founding borders on legerdemain. Such is actually not the case. At the risk of being condemned as needlessly repetitious: precision founding is not to be regarded solely from either the standpoint of the foundry or from that of the machine shop but chiefly from the standpoint of manufacture. It is only when perceived from that angle that its range and potentialities may be fully understood and appreciated.

Modeling Waxes

One of the first considerations is the pattern waxes carried in stock by foundry supply houses, materials which may or may not be suitable for the work at hand, since their resinous content is as a rule not very great. After all, these waxes are mainly intended for patching up patterns, for filleting and the like. It is upon the

resinous matter in them that their adaptability to precision founding rests.

Hence, for once, this work will avail itself of a material manufactured by dental laboratory supply firms such as the S. S. White Co., Philadelphia. The material is obtainable either directly from the manufacturer or from dental supply houses. It is relatively inexpensive, about 75c per lb in retail lots or 64c per lb in quantities of 100 lb or more. It can be used a good many times over so long as it is kept clean and is not overheated in its reduction from a solid to a plastic stage.

This overheating needs to have particular attention paid to it. For while in a pinch the stuff can be heated over an open flame this high application of heat drives off its oils and it becomes too brittle for pattern use. Hence it is advisable to "run it down" in a waterbath at 170 deg F and to keep the vessel containing it covered in order to preserve the oils. This running-down is perhaps misleading —the wax does not ever become so fluid that it actually runs. The best that can be expected from it in the way of fluidity is an oozing consistency, a sluggishness which, however, is quite deceptive. For heated to this oozing state the compound will fill an open mold with absolute precision no matter how delicate its details may be and upon a shrinkless hardening will show an excellent pattern surface, hard and perfectly smooth, with the most minute detail standing out sharp and clear.

In fact this material is of such value not only in precision founding but also in general pattern making that the following description seems warranted.

Run the material down in a water bath, at about 170 deg F and keep the melting vessel covered to preserve the oils. If these oils are lost through evaporation the material will turn brittle, dull and will shrink upon cooling. No shellac is needed, and indeed is not wanted since it only would dull sharp delicate details. The results obtained from patterns made of this material are not excelled by those made from anything else. The deficiencies of this compound are its not being as strong as wood patterns, its logginess, and it not having a distinguishable name. It is called Exact Compound, and comes in ¼-in. thick plates, is dark-red in color and hard.

In its application the following example is offered with due regard to the time element involved in the production setup were it actually carried out.

Supposing some brass or cast-iron bevel gears are wanted in quantity and that such quality as the centrifugal process delivers would satisfy requirements as to accuracy and finish of the teeth. Only the basic procedure of making the patterns will be discussed here.

Casting Gears

This job would not be a run-out proposition since the value of a wax pattern consists chiefly in its requiring no withdrawal from the mold, this making it feasible to produce castings virtually impossible to make in any other way. But a bevel gear can readily be gotten out of its mold because of draft angles inherent in its design. Consequently the patterns for this gear would be either split or solid and would be used through to the finish of the order. These gears could be of any size within reason— from several inches to a couple of feet. They could be cast even larger and still retain a reasonable degree of accuracy; for really small gears the lost-wax process would be more expeditious, all conditions being equal.

There would be two ways of casting such gears centrifugally. One is to cast each gear in its flask and this would be done if the gears were large. The other is to arrange the patterns in a circle in a large diameter flask, thus pouring a number of them at a time.

The latter method would probably be the more economical if the gears were small. Moreover, in the case of small gears of fine pitch this method would be chosen for still another reason: Arranged on a horizontal plane these small gears would in their pattern-circle lie with their teeth topmost, the gates would be at the bottom of their hubs and this setup would eliminate all danger of inrushing metal injuring the delicate structure of the teeth. For, if cast individually in single flasks their fine pitch and consequent tender cross-sections would suffer from being too close to the sprue. The reasons for such objections will be explained next week in a discussion of the pouring of cylindrical castings through their cores.

So, for the sake of expediency the hole through the hubs of these gears will here be disregarded and attention focused on the size and contours of the gear itself and on the accuracy of its teeth. To clarify the issue, let it be assumed that the gear now under consideration is 5 in. OD diam and of, say, a 14 pitch. For present purposes the metal it is going to be cast in is unimportant.

It is further assumed that a starting pattern has been made, a pattern oversize in every respect to allow for metal shrinkage, and that from this pattern a number of trial castings have been obtained so that, at this point, the correct depth and thickness of tooth and other data relating to the actual production of these gears have been ascertained. All that remains now is the making of the patterns—matrices in the reverse—so that production can get under way. To use corrected trial castings as patterns would in this case not be advisable since light weight and split patterns are wanted here for the sake of making time.

A plaster mold would be made of a corrected trial casting and into both halves of this mold poured, or oozed, the Exact Compound. When this has cooled and is hard the casts are taken out of the molds and trued up in a lathe and each half is turned to the parting line as shown in fig 26. Cut with a round-nosed tool of a lively rake and run the lathe at slow speed to avoid heating; for finishing cuts use water as a coolant. In this fashion the two halves of the gear pattern are brought into alinement with each other.

Since a split pattern is wanted— because these gears would be cast in a circular pattern arrangement, half in the drag, the toothed half in the cope of a cylindrical flask—two holes are drilled for dowels and bushings while the gears are in alinement. For both pins and bushings the holes are drilled big; big for the pins because they are headed to prevent their pulling out of the pattern, and big for the bushings to insure perfect matching. In both cases the holes with their pins and bushings in alinement are plugged with some of the compound heated over an open flame, alcohol for instance, so the stuff burns itself into a positive grip on the pins and the bushings as well as on the pattern. If these bushings are knurled, they will grip well.

Should in some other cases circumstances demand a solid pattern, coarse-threaded wood screws are set into one of the two halves and the oversized holes in the corresponding half of the pattern are solidly plugged around their threads.

Valuable as this Exact Compound is, it is useless to try pouring it into closed molds no matter how large a sprue hole. When using this material always prepare to make the pattern in two or more parts and afterwards assemble it.

In taking impressions from a master pattern in order to arrive at

matrix design and dimensions use the material while it is just warm enough to handle. When hard it may be engraved, filed with coarse-toothed bastards or vixen-type file, since it clogs readily, or cut in any other manner.

In making the starting pattern for the gear, aluminum or some other easily cut metal should be selected since a fly cutter would be used in cutting the oversized teeth. The same type of cutter would be used later on the trial castings when reducing them to sizes corresponding to metal shrinkage allowances. The process is somewhat costly when regarded from a standpoint of so-much-per-pound-of-casting. But, taking the view that the process results in an article where machining and other overhead is reduced to a minimum the procedure takes on a somewhat different aspect. To say nothing of the greatly improved material, especially when these gears are cast in iron.

Run-out Waxes

For patterns used in connection with the so-called lost-wax process a product like that manufactured by Zophar Mills, Inc., 112 Twenty-sixth St., Brooklyn, is probably the most practical since it is "dry," low in viscosity, and less expensive than straight carnauba wax. Zophar Mills, Inc., sells its C-101, a compound especially made for this type of founding, for 45c per lb in small lots. The wax runs at about 145 deg F.

The lost wax or *cire-perdu* appellation, in a colloquial sense it means "wax gone to hell," dates back into an unknown antiquity. It was in use at least a thousand years ago, and Cellini in his autobiography renders a fairly comprehensible account of it in the pouring of his Perseus statue. No doubt in those days the wax actually went to blazes in its burning-out process. Today steam is often used to melt the wax out of cavities and thus it may be recovered.

It just does not pay to use cheaper grades for patterns and in most cases not for the sprue and the gates either. For oily waxes tend to rot (soften) the metal passages and this causes particles of the mold to be washed into the pattern cavity. Of course, the roughness and inaccuracies resulting from rotted or softened mold surfaces need no elaboration. In order to avoid wasting the expensive wax, sprues ought to be made hollow and so for that matter ought the gates when these are big enough to allow it. Such hollowness has the further advantage of rapid melting, thus quickly clearing the way for the body of the pattern to run out.

The procedure of making hollow sprues is quite simple. Into a split plaster mold with a hole of the required diameter, and thoroughly soaked in water first, pour the molten wax and immediately empty the mold again, as has been described earlier in the instance of making wax casts from glue molds. Repetitions build up a wall to any desired thickness to which the gates may be fused. The gates may be made in a like manner and so, for that matter, may the pattern itself if nothing would interfere with its accuracy, such as for instance, cave-ins due to wax shrinkage.

Occasion is here taken to point out that sprues should reach some distance below the bottom of the gates so that mold particles dislodged by the force of the whirling, down-rushing metal will not wash these abrasions into the mold cavity. The action of the centrifugal force will keep these light particles near the axis of the spinning metal and a depression at the bottom of the sprue will afford them an opportunity to do so.

Vent Waxes

Vent waxes are of the standard varieties obtainable from any foundry supply house and their use in centrifugal founding is decidedly limited. All are extremely oily and should be used only in cases similar to that of the aluminum arch spoken of in Part IV and never in patterns, gates and sprues in literal precision founding. Not even in baked sand molds since their heavy carbon deposit left by the baking seriously impairs the permeability of the mold.

The Running-Out Process

The way of preparing running-out wax patterns is so largely a matter of circumstances it would lead to over-elaboration and mixups to lay down specific ways and means. It would be like describing how to drive a nail. In mass production setups the molds are routed through to especially constructed, and insulated, steam chambers where they remain for a length of time determined by the size of their mold cavities and their cross-sections, by their length and size of gates, sprues and so forth, the wax discharging into containers set under the drying racks. In a jobbing foundry they would be put into the core oven and run out at a low heat. The latter way, although expedient, is costly since the heat of the oven has to be high enough to overcome the moisture of the mold before it can induce the wax to run and this takes time. Furthermore the necessary high, dry heat is bound to burn the wax. The steaming-out method, although it involves the cost of putting up an insulated steam cabinet and providing, in some fashion or other, for steam, is a lot cheaper in the long run because steam preserves the wax. To line such a chamber or

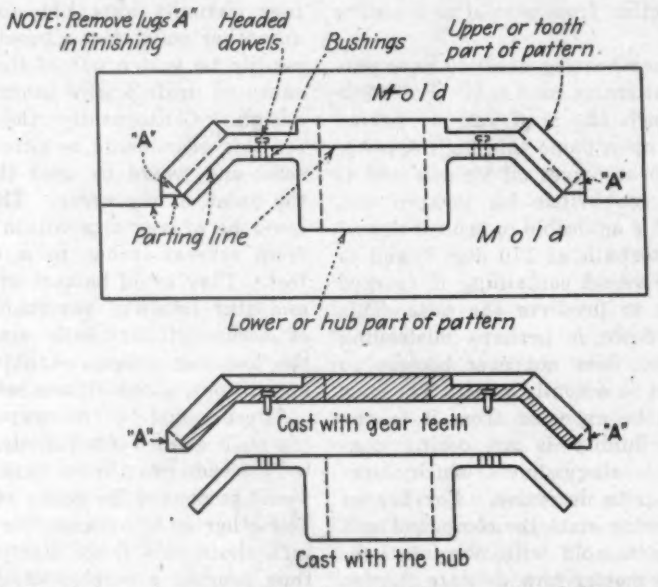

FIG. 26—Two halves of a wax pattern for a bevel gear. Each half is turned in a lathe to the parting line shown.

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cabinet with steam coils is not fully satisfactory; it is only a hot and moist enclosure which really reduces the loss of wax to a minimum. The molds, being soaking wet anyway, are not affected by this steam bath. Another reason why a dry heat should be used only reluctantly is that surface cracks in the mold may result. To be sure there is not such a very great danger of cracking since the heat is after all quite low. Still there is that chance, however remote, and in view of all the thought and labor which has gone into the work up to this stage no chance at all should be taken. There is time enough for short-cuts after the entire precision founding process has been brought under control, a commendable spirit once exhibited by an experimenter in vacuum casting. He wished to save time in drying his molds and figured that since suction drew both metal and gases into the mold the same suction would surely draw both metal and gases through the mold's bottom if its density did not prevent the gases, steam included, from passing through the bottom of the mold the instant they were generated. In other words, he saw the entire mold, particularly its bottom, as a sort of sieve, retaining the metal but permitting the gases to pass.

Supported by this logic and nothing else save a concrete pillar 2 ft through, behind which he hid while he tripped off his pouring and vacuum valve mechanism he achieved an instant and complete success. Nothing blew up and he had a perfect casting. The steam generated by the white-hot metal being shot into a decidedly damp plaster-base mold had been drawn with equal speed into the vacuum tank.

The incident does suggest some interesting potentialities: instantaneous and continuous casting, for instance, with a high degree of finish and precision.

Plaster Carving

Insofar as the trade of plaster carving has any bearing on the making of patterns in connection with precision founding, a few elementary pointers regarding it may be of help. The plaster used for such work should be of the hard and tough variety and if lines are to be laid out in pencil, the casts, planed and squared up, must be thoroughly dry. Drying them in ovens at a gentle heat is quite all right. But since plaster cannot be cut dry, a brush dipped in water must frequently be passed over the design; for a brief time the plaster will then cut like soap. Hand cutting tools ought to be of high-speed steel mainly because carbon steels rust with extraordinary rapidity in contact with plaster (stainless steel won't hold an edge) and this rusting results in miserable execution since such tools must be kept sharp. Do not, ever, use sandpaper or emery cloth on plaster; the work here is one of carving, not of producing some spurious slapdash sort of finish. Lettering or other highly accurate and uniform details should be cut slightly deeper than they would appear on the castings since the shellac or whatever material the carved plaster pattern is protected by will as a matter of course rob these details of some of their sharpness. The rest is a matter of skill the aquisition of which requires a direct laying-on of hands. Should initial attempts fail to produce a workmanlike looking job, it may be recalled that plaster-carving is a special trade at which men have served an apprenticeship.

Injection Under Pressure

Alexander Saunders & Co., 95 Bedford St., New York 14, supply apparatus for wax injection under pressure. The capacity of these range from a couple of quarts to several gallon. The principle of these affairs is quite simple: the wax is run-down by means of electric heating and kept at a constant temperature subject to instant expulsion by means of compressed air. The machines are inexpensive enough to warrant consideration before deciding to build one's own, using, for instance, steam coils and pressure from air-lines already installed on the premises.

Production Sequences

The flasks needed for the casting of the 3-in. ring could be cut from 4-in. ID steel tubing—not brass because of the expansion under baking heat. The sections would be about 2¼ in. long and squared up at both ends. The (Mouldene plaster) mixture for the first pouring, where less than an inch of investment is wanted, would be made with a lesser water content than the second pouring which completely invests the pattern. The reason for the lesser water content in the primary pouring is that this part of the investment ought to be fast-setting so that when the wax pattern is placed atop of it in the flask, the ¼-in. projection at the bottom of the central hub (fig. 19) will be pushed all the way through the investment and the pattern will have a fairly stiff base to support it when the secondary pouring takes place under vibration. A point of nicety is here involved: the primary pouring must not be so stiff that its over-rapid setting prevents perfect bonding with the more fluid secondary one. For locating the patterns centrally in their flasks use a sheet-metal gage locating from the outer periphery of the flask, this also centralizing the short 1-in. brass tube, withdrawn when the secondary pouring has set (See Part IV, fig 17). For in centrifugal casting both the flask and the mold cavity with its sprue hole must run reasonably true.

In making the wax patterns, dust the matrix with zinc or aluminum stearate to prevent sticking. An addition of 1 pct Aerosol to the water used in the Mouldene-plaster mixture will cause all the rapid liberation of air inherent in both the asbestos fibre and in the plaster that can reasonably be expected. Vibration will do the rest as well as cause a sound settling of the pattern's investment. Of whatever use "vacuuming"—placing flasks under a vacuum bell in an attempt to suck the air out of them—may be in dental laboratory or jewelry manufacturing practice, in a foundry under production that practice has no place. Nor is there any need of it. The Aerosol will so reduce the surface tension of the water that air content rises because of its own buoyancy and where pressure of mass hinders this rising gentle vibration will assist these miniscule bubbles in their upward trend.

Since running-out the wax patterns and the baking time of the mold has already been discussed there remains but a consideration of the two heats, or rather a further consideration since both have also been touched upon; i.e. the heat of the mold at pouring time and that of the metal about to be poured. The mold, for reasons given—namely those of absolute absence of moisture and greatest possible conductivity of flowing metal—ought to be around 300° F at time of pouring.

As to the metal, it is well known that all metals contain impurities no matter how microscopic and that these retard their flow. And while in ordinary sand casting the presence of these impurities may, for various reasons, be of minor importance, in precision founding they are decidedly of major importance, both from the founder's point of view and from that of the user of such castings. This holds particularly true in cast iron and in steel where, without a refining

process, these metals cannot be cast with complete success by either the centrifugal or the vacuum method.

Removing Metal Impurities

In the matter of the 3-in. ring the yellow brass mix in the crucible may be cleaned with some borax stirred well into the metal with a graphite rod. National Carbon Co., Inc., Cleveland, makes graphite rods anywhere from ½ in. thick on up, intended for such stirring. These rods are threaded at one end to fit into pipe handles. They cost only a few cents a piece and with care last quite a long time. Merely to throw some borax atop the molten does not do much good; the impurities are scattered throughout the mix and unless they are brought to the surface by means of stirring they cannot combine with the borax. Every molder knows that such cleaning makes for a better flowing metal; in precision founding it results in being able to pour at several hundred degrees below normal pouring heat because of the centrifugal force employed and because the metal is injected into a hot and perfectly dry mold.

Low-flowing heats are important factors in these two founding processes, centrifugal and vacuum, because of a reduction of initial heat-shocks at time of pouring and because of the cooling of the metal afterwards. There is further the baking heat to be considered. A low, slow baking of the mold results in smooth and strong mold walls and hence in smooth and accurate castings. Molds baked at high temperatures in order to impart permeability, "breathing," are bound to have open-pored and consequently rough inner surfaces. The necessity for such breathing is, in standard cases, primarily predicated by the presence of impurities in the metal, impurities which cause that metal to demand a high pouring temperature. [*In a succeeding article an iron refining process will be discussed, specifically in regard to centrifugally cast bearings, pressure cylinders, surface plates and the like.*]

It may be opportune to summarize at this point the operations on the 3 in. ring. Starting with an oversized wood pattern of the 3 in. ring, a glue mold was made. This glue mold was used to produce the plaster try patterns which in turn were used to make the trial castings in split flasks due to the gates being an integral part of the pattern. The pouring of these rings in yellow brass and in iron will be taken up next after the subject of metal refining has been looked into.

Ed. Note—Next week the author continues this series of articles with a discussion of pouring of cylindrical castings through their cases.

Determining Surface Resistance Of Aluminum for Welding

A KELVIN double-bridge device has been devised by Clepo Laboratory, Frederick Gumm Co., Kearny, N. J. to help the welding engineer in improving his control over the cleaning and deoxidation of the aluminum stock.

The apparatus consists of two basic parts, namely, a press and the bridge. The press shown in fig. 1 is 28 in. high overall and is constructed of cold-rolled rod and 1 in. plate. The top and bottom plates are fastened rigidly to the rods which must be carefully machined and aligned. The two center plates must slide on the shafts without any side play. It is possible that some of the commercially available laboratory presses could be converted for this purpose. The electrodes are preferably made from regular welding tips with a 4-in. radius of curvature. The pressure is provided by a heavy coil spring which is calibrated for 1000 lb total pressure.

The bridge should be wired with No. 10 B&S copper for the portion of the circuit shown in heavy lines and 50A flexible cable is used for connecting the bridge and battery to the electrodes. Smaller wire may be used for the rest of the circuit. (See fig. 2.)

In operation, two aluminum coupons are clamped between the electrodes (just as when preparing shear test specimens) and the pressure raised by the hydraulic jack to 1000 lb. The alligator clips (attached by ordinary lamp cord to the bridge) are fastened to each coupon. To avoid reversed polarity the clips should be marked upper and lower. The galvanometer switch should be in the down position (see circuit). The main switch, S_B, is pressed for an instant and the galvanometer will deflect violently. Immediately change the galvanometer switch to the up position and the damping resistance, R_G, rapidly returns the indicating beam to its rest position. It is well to keep R_G across the galvanometer at all times except when actually making readings. When the switch is depressed a current of 50 to 75 amp flows through the external circuit (heavy line) but very little flows through the measuring circuit due to its high resistance. The decade resistances are adjusted until the galvanometer no longer shows any deflection when the key is depressed. When the D.P.D.T. switch connects

(CONTINUED ON PAGE 146)

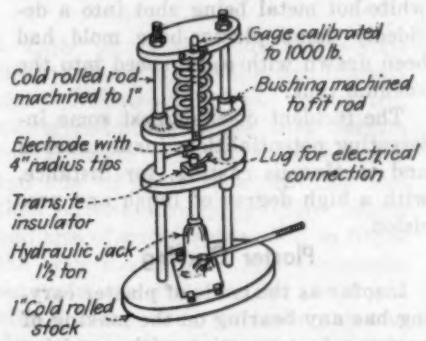
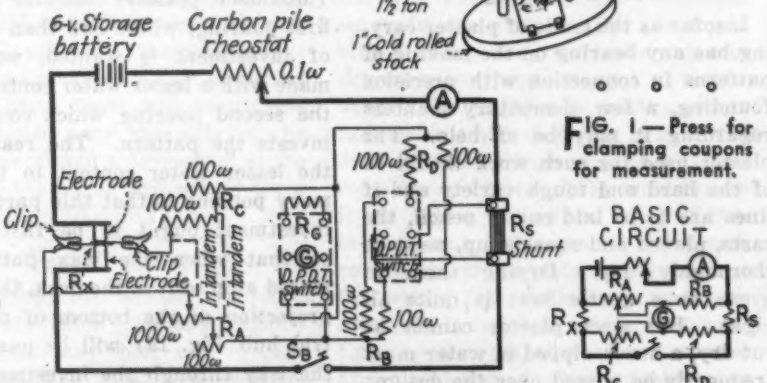


FIG. 1—Press for clamping coupons for measurement.



$$\frac{R_x}{R_S} = \frac{R_A}{R_B} = \frac{R_C}{R_D}$$

FIG. 2—Kelvin double-bridge circuit. Two aluminum coupons clamped between electrodes constitute R_x. Alligator clips are fastened to coupons and connect R_x to the bridge circuit.

New Heat-Resisting Iron

MANY of the iron castings manufactured by Alten's Foundry & Machine Works, Lancaster, Ohio, go into applications where the heat factor is involved, and because of this the company found it necessary to have some work done on the construction of temperature-tensile strength curves for several of its alloy irons. Tests have been recently completed at Valparaiso University, Valparaiso, Ind., on Alten's No. 18 alloy and are described herein. Practically the same tests were made at an earlier date on Alten's No. 11 and No. 15 alloys, the results of which also are included here. The chemical analysis of the three irons are given in the accompanying table.

The results obtained show that for temperatures up to 1000° F Alten's No. 18 alloy should work out satisfactorily in service applications which include castings for stokers, oil refinery parts, low temperature annealing furnace parts, furnace items, hangers, tube supports, rubber and plastic mold parts, tempering boxes, grate bars, access doors, explosion doors, arch joint fillers, peep holes, tube hangers, etc.

Chemical Analyses of Alten's No. 18, No. 11, and No. 15 Alloys

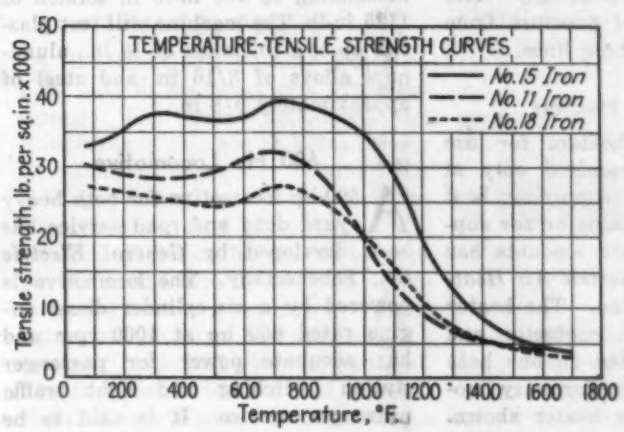
Element	No. 18, Pct	No. 11, Pct	No. 15, Pct
Silicon	1.85	1.74	1.82
Sulphur	0.071	0.112	0.072
Phosphorus	0.262	0.369	0.164
Manganese	0.51	0.51	0.61
Total carbon	3.77	3.53	3.54
Graphite	2.96	2.74	3.13
Combined carbon	0.81	0.79	0.41
Chromium	1.07	0.07	1.46
Nickel	0.18	Trace	0.16
Molybdenum	0.04	0.03	0.58
Vanadium	0.09	...	0.08
Copper	0.03	...	0.04

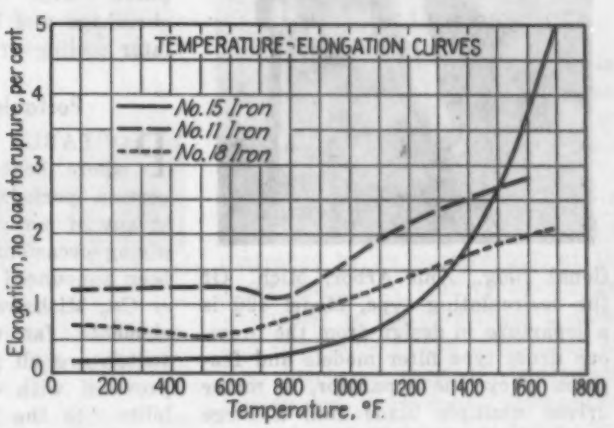
The No. 18 alloy is essentially a 1 pct chromium alloy of iron, a cupola product.

It was noted, after plotting all the points for the temperature-strength curve, that they were all very consistent above 1000° F, with wider variation below that point. It may be that a difference in cooling or some other manufacturing factor produced variations in structure, in that above 1000° F the metallurgical structure was less dependent on actual initial structure than upon testing temperature.

As mentioned, Alten's No. 11 and No. 15 alloys have also been tested. The temperature-elongation curves and the temperature-tensile strength curves shown here are based upon data from these tests. The table gives typical analyses of both these irons.

It may be noted that the temperature-tensile strength curve of No. 18 alloy approximates the curve of No. 11 alloy up to nearly 1000° F, and that above that temperature the No. 18 alloy has greater strength.





Effect of Lead Additions on Free-Cutting Steels

WHILE the effect of lead additions in improving the machinability of steel is a well established fact, its effect on chemical composition and segregation is far less well known. To determine just what effect lead additions do have on the chemistry of free-cutting steel ingots, C. S. Graham of Messrs. John Lysaght, Ltd., Scunthorpe, Lincs., investigated two ingots, one lead-free and the other lead-bearing for the Committee on the Heterogeneity of Steel Ingots of the British Iron and Steel Institute.

Chemical composition of the ingots was 0.09 pct C, 0.28 to 0.29 pct S, 0.050 to 0.054 pct P and 1.09 to 1.10 pct Mn. Fifteen lb. of lead shot were added to the metal stream during teeming, the addition being started when the metal in the mold reached the 3-in. mark.

Both ingots were sectioned along the vertical axis and chemical analyses were made from samples taken from one-half of each ingot at the standard positions. Practically no difference between the chemical compositions of the two ingots was found except for oxygen contents which was slightly lower in the lead-bearing steel. Tests of samples taken at four horizontal planes of the lead-bearing ingot showed the lead to be evenly distributed. Sections taken from the same four positions of the ingot were heated to 1292 deg. F. in a reducing atmosphere and in no case was there any exudation of lead visible to the naked eye. The only segregation of lead was at the extreme bottom of the ingot. A section taken 4 pct from the bottom was clear of segregation.

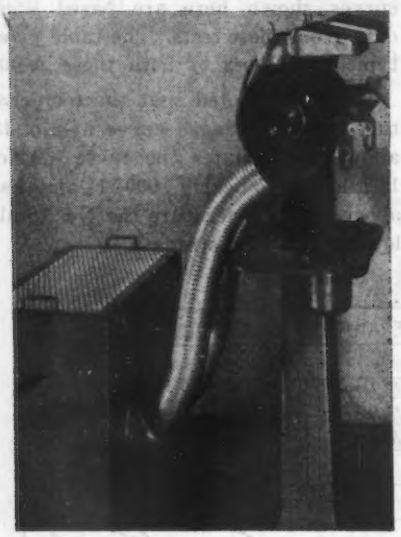
Macro-examination of the ingots by sulphur prints and nitric acid etch showed that the only difference of importance in the two ingots was the difference in depth of the columnar zone, which was one-half in. less in the leaded ingot.

New Equipment

Plant Service

. . . Recent developments in accessories for the metal working shop are described in the following pages.

A PORTABLE dust collector for grinders, sanders, abrasive disks and cut-offs has been announced by *Aget-Detroit Co.*, 602 First National Bldg., Ann Arbor, Mich. Of the recirculating type, Model 420 is a departure in design from the previous drum type filter models and features a cyclone separator, a motor driven multiple blade fan, a large dust storage bin and a spun glass filter. Dust and dirt drawn in from the source first enter the cyclone separator where most of the dirt is removed. The flat filter, which comprises the top of the collector, removes the balance of the dust and dirt returning the cleaned air to the working space. The unit measures 12 x 22 x 24 in. Power to provide the suction (rated at 420 cfm with a 1-in. static suction in a 5-in. pipe) is supplied by a multiple blade fan driven by a ¼-hp continuous duty 3450 rpm motor which is available to suit practically any 60-cycle power supply.



Air Compressor

A COMPLETE line of both portable and stationary air compressors for requirements with capacities up to 500 cfm has been announced by *Jaeger Machine Co.*, Columbus, Ohio. By balancing low and high compression cylinders in a W-shaped bank and micro-honing and lapping in parts to close automotive tolerances, the resulting efficiency is said to permit full rated output of air with 20 to 30 pct lower piston speed and the power plant operating well below its capacity. By improved valve and cylinder cooling design and more efficient intercooling of the air between compression stages, air compressed to 100 lb psi is said to be held to a temperature within 100° of the ambient atmosphere with correspondingly less shrinkage and loss of pressure from later cooling in the hose lines.

Portable Air Heaters

PORTABLE air heaters for use where heat is required only at certain periods, for supplying heat at any of many locations or for supplying occasional extra amounts has been announced by *Electric Air Heater Co.*, Mishawaka, Ind. The heater elements, fan motor, contactor and switch are all mounted on one base provided with castors for easy mobility. In the 20 kw heater shown, standard Electromode rectangular heater elements are used, consisting of sheathed resistors cast in one-piece aluminum castings.

Electric Unit Heaters

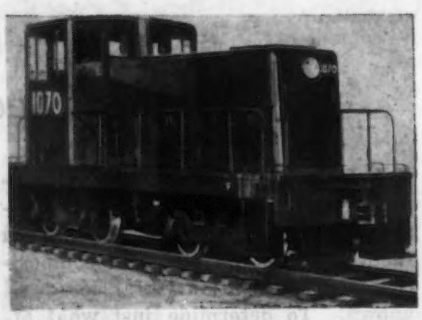
ELECTRIC unit heater models made by *Electric Air Heater Co.*, Mishawaka, Ind., incorporate one-piece finned aluminum elements which consist of sheathed resistors so that no hot or incandescent wires are exposed and oxidation is prevented. Six models, 1.5 to 7.5 kw., can be used either as portable heaters or arranged for ceiling or wall suspension. Larger sizes, from 10 to 60 kw. are for ceiling or wall suspension only.

Testing Machine

A SMALL machine for testing plastics, plywood and lighter sheet metals has been announced by *Southwark Div., Baldwin Locomotive Works*, 940 Simpson Street, Eddystone, Pa. The machine which has an alternating force capacity of 100 lb is also suggested for testing structural components and machine parts in repeated bending and torsion. A feature of the machine permits any predetermined alternating load to be kept automatically constant regardless of the changes of deflection that may occur in the specimen under test. Its speed is 1800 load cycles per minute and it has a maximum capacity in bending of 200 in-lb in torsion of 1125 in-lb. The machine will test plastics up to a thickness of ½ in., aluminum alloys of 3/16 in. and steel of approximately 0/8 in.

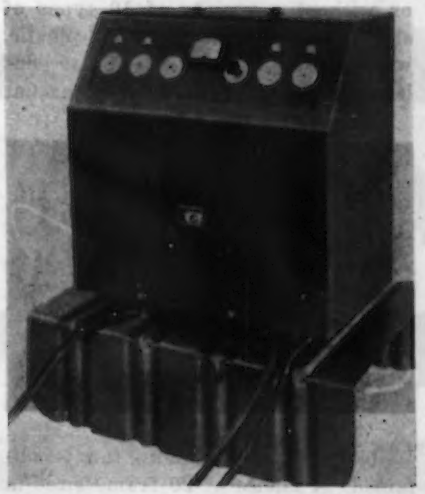
600 Hp Locomotive

A 600-hp locomotive for both heavy yard duty and road service has been developed by *General Electric Co.*, Schenectady. The locomotive is powered by a six-cylinder diesel engine rated 660 hp at 1000 rpm and has adequate power for passenger station switching and light traffic passenger service. It is said to be particularly adapted for freight and passenger service on railroad lines where roadbed and rail weight require limited axle loadings.



Truck Battery Charger

TWO battery chargers for motorized hand lift industrial trucks have been announced by *Electric Products Co.*, Cleveland 12. With



these battery chargers the truck operator can recharge his own batteries in the work area. Automatically the charging current begins at the proper value. The equipment shuts down in case of power failure. When power is restored, charging resumes and the charger shuts down completely when the battery is charged fully.

Hydraulic Packing

A HYDRAULIC packing which is said to do away with extrusion damage has been announced by *Weatherhead Co.*, 300 E. 131st Street, Cleveland. Called the Weatherhead T-Ring packing, it consists of a resilient sealing ring of synthetic rubber in a T-section backed up or supported on the side by two non-extrusion ring retainers or guards. These non-extrusion rings are split and are made of laminated phenolic material. The installation is such that the synthetic rubber member is under slight compression which provides the static seal. When the operating pressure is increased the flange of the T-ring packing expands radially against the non-extrusion rings, holding them in contact with the surface of the cylinder or piston rod. This action of the packing prevents the sealing material from being damaged by extrusion into the clearance space between the mating parts.

Plastic Gasket Material

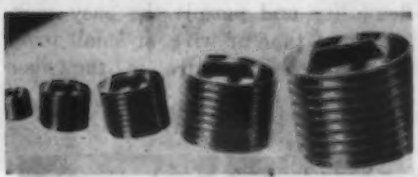
A GASKET material called plastic gasket has been announced by *Flexrock Co.*, 3628 Filbert Street, Philadelphia 4. It can be applied to surfaces of flanges, about 1/64 in. thick. The plastic gasket can also be applied over ordinary gaskets to increase their effectiveness and preserve them. It is claimed that the material prevents leakage, oxidation, corrosion, that it will not dry out, burn out or blow out and that it is unaffected by temperature and pressure. It is further claimed that joints sealed with the plastic never freeze can easily be broken at any time.

Synthetic Rubber Adhesives

A LINE of synthetic rubber adhesives has been announced by the *B. F. Goodrich Co.*, Akron, Ohio. One is for general utility use and will adhere to almost any clean surface. For metal adhesion two special cements. known as the Plastilock 300 series, have been developed. The first is used with vulcanized neoprene when it is bonded to porcelain, metal, etc., while the second is used with uncured neoprene for the same purpose.

Plastic Pipe Seals

PLASTIC pipe seals and thread protectors in countersunk pattern have been announced by *American Molded Products Co.*, 1644 N. Honore Street, Chicago 22. Seals and protectors made of plastic are said to be



non-corrosive, dielectric and to exclude moisture, oil, dirt, grit, etc. Sizes available are ⅛, ¼, ⅜, ½, ¾ and 1 in. The square sockets of the new countersunk pattern are of dimensions to fit commercial square bars of standard sizes. Dimensions are the same as the maximum size of cold rolled square steel bars given in A.S.T.M. specifications.

Engine Lubricant

AN internal combustion engine lubricant has been announced by *Carbide and Carbon Chemicals Corp.*, a unit of *Union Carbide and Carbon Chemicals Corp.*, 30 E. 42nd Street, New York 17. The lubricant which can be manufactured to any desired viscosity is wax-free. Pour-points vary from —30° to —80° F. Flash points range from 30° up. The materials have densities approximating that of water. Carbon residue values are less than 0.01 pct, regardless of viscosity. The lubricant is characterized by low change of viscosity with change in temperature having viscosity indexes in the range of 140 to 160. The compounds are manufactured in two types, water soluble and water insoluble, and do not contain any petroleum oil.

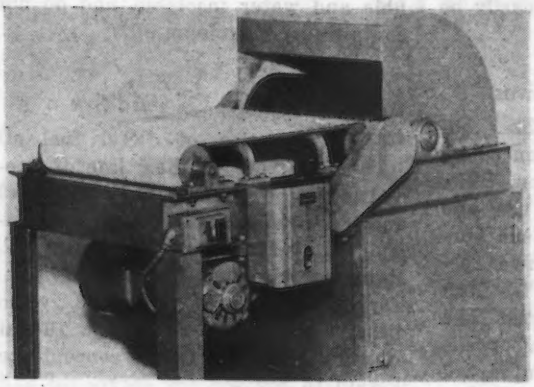
Diesel Fuel Oil Additive

THE addition of diesel fuel oil concentrate to their line of special oils and greases for industrial and commercial uses has been announced by *Hood Refining Co.*, 194 N. Hamilton Avenue, Greensburg, Pa. Especially prepared as an additive to diesel fuel oils (4 oz to each 10 gal of regular fuel oil), the concentrate is said to prevent the corroding and sticking of injector nozzles and also to give top cylinder lubrication where ordinary oil fails, thus preventing the formation of hard carbon and sticking rings. It is also said to penetrate the pores of the metal and to prevent hard carbon from adhering to the metal surface.

Fire Extinguisher

TRIGGER control for their carbon dioxide fire extinguishers has been extended to the larger portable models according to an announcement by *Walter Kidde & Co., Inc.*, 140 Cedar Street, New York 6. Operated with one hand, the model is controlled by an upward pull of the index finger. A feature of the extinguisher is the permanent bushing and removable siphon tube which allows inspection, periodic hydrostatic testing and, if necessary, replacement of any part without devalving. The locking pin fits into a blind hole so that there is said to be no possibility

of its getting bent and jamming. The seal wire is placed where it is least likely to be broken and most easily observed.



Disintegrator

THE Rawson distintegrator which breaks up almost any metal into a small multi-fractured chip that can be converted to a vine powder with one Hammermill operation has been announced by *Franklin McAllister Corp.*, 135 S. LaSalle Street, Chicago 3. Cast iron can be reduced to a fine powder thus eliminating the necessity of the Hammermill operation. This machine is equipped with a feed mechanism that regulates the feed and can be adjusted to various speed and sizes of powder, grit or shred.

All Purpose Pump

A PUMP, the Flow-Master that will transfer, meter or proportion any product that can be pumped has been announced by *Marco Co., Inc.*, 511 Monroe Street, Wilmington 17, Del. The principal feature of the pump is said to be the fact that it will maintain volumetric efficiency against normal wear. Seals employed are of the single-gland type, and are enclosed in stainless steel housings. The pumps are built in capacities for all standard ranges.

Ballasts

DISK shaped ballasts for the operation of 12-in. Circline fluorescent lamps have been announced by *General Electric Co.*, Schenectady 5. They are available in two single-lamp types, either a conventional, uncorrected power factor design or a high power factor lead circuit design without a step up autotransformer. A compensator is provided in the latter to raise the starting current and it is intended for use with a manually operated starter. The leads of both types are brought out through the ballast cover plate and threaded through the lamp stem for connection to the fluorescent lamps.

Balancer

A BALANCER developed especially for repair shops and maintenance organizations that have a few parts to balance, has been announced by *Globe Tool & Engineering Co.*, Dayton, Ohio. A wide range of weights and sizes can be accommodated in this model. Up to 300 lb. weight and 20 in. in diameter is possible. Parts can be balanced until their remaining vibration is less than .0002".

Wire Strapper Glove

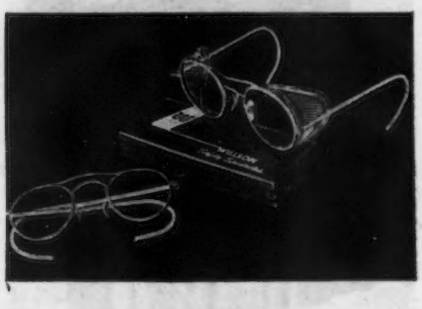
THE development of No. 15359 industrial glove for wire strappers has been announced by *Industrial Gloves Co.*, Danville, Ill. The glove has a palm patch of tanned cowhide for extra service. The fingers and thumbs are left open to increase flexibility and permit the easy picking up of tape or wire, or small tools, etc. Another feature is the open back.

Acetate Safety Goggles

TWO Full-Vue acetate safety goggles of extremely light weight have been announced by the *American Optical Co.*, Southbridge, Mass. The goggles are spark-proof and are recommended for the worker whose skin is sensitive to metal goggle frames.

Safety Spectacles

SAFETY spectacles have been announced by *Willson Products, Inc.*, Reading, Pa. The spectacles are available in clear or green glass with or without a variety of 10 types of side shields in clear or green plastic, wire mesh or leather. Clear flat lenses, 1.25 curve or 6 curve, or flat



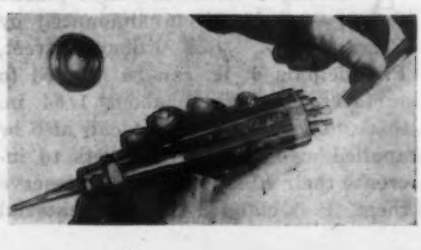
Willsonite in four shades can be obtained. A choice of 20 frame sizes is provided. Spectacle lenses can be ground to prescription if desired.

Portable Scaffold

CAPABLE of handling weights up to 1000 lb., a double panel tower with folding outriggers has been designed and built by *Universal Fittings & Scaffolding Co.*, Zelienople, Pa. Depending upon the particular need, the tower is built for a minimum working height of 8 ft. and extends as high as 80 ft. or more. Special features include two folding outriggers to permit passage through narrow aisles and to conserve floor space when not in use. Only aisle width is required for moving from one location to another. Removable guard railings provide clearance height if head room is limited. When telescoped, an entire 60 ft. tower requires only 4½ x 15 ft.

Multi-Purpose Screwdriver

AN all in one screwdriver has been announced by *Standard Pressed Steel Co.*, Jenkintown, Pa. Called the "Unbrako" key kit, the tool which resembles a screwdriver in appearance, has a hollow handle of transparent plastic composition which forms a receptacle for the seven keys or bits which comprise the kit. The keys which fit all socket head, Phillips head or slotted screws are inserted in a chuck in the lower part of the handle and are used in vertical position. In ordinarily inaccessible locations, they can be inserted in the socket at right angles to the handle.



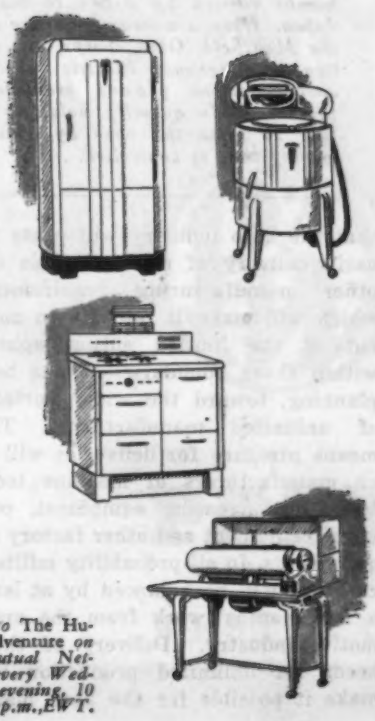
MANUFACTURERS GAIN 7 WAYS WITH FORGED PARTS

BY REVERE

Manufacturers of a great variety of products, from refrigerators to door knockers, can build better goods with the help of forgings. Here are seven reasons why, based on Revere's long experience:

1. *Revere offers you a single, competent source for superior forgings in copper, brass, bronze, aluminum and magnesium.*
2. *Fine, dense, uniform grain structure prevents breaks or leaks. One solid mass of metal insures great strength.*
3. *Easy to machine . . . no blowholes or hard spots.*
4. *Relatively smooth, non-porous surface is easy to buff and finish. Takes plating better.*
5. *Precision made to close tolerances . . . minimum of excess metal to machine away. Often certain finished details can be completely forged.*
6. *Several parts can often be combined, by good engineering, into a single forging. Inset (above) shows forged part which replaced three piece assembly.*
7. *Nearly a quarter century of forging experience insures your complete satisfaction.*

Write for full information.



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REVERE

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Assembly Line . . .

STANLEY H. BRAMS

• War's end to give open track signal to auto plants . . . Volume of million assemblies foreseen for this year with end of quotas.

DETROIT—The ending of the war changes overnight the accumulated gloom of the automobile industry over its prospects. Now the production gates are wide open, and the scramble in Detroit is on.

With elimination of quota restrictions expected momentarily—perhaps they will have gone through even before this reaches reader hands—the automobile companies are engaged in a frenzied race to pile on top of their limited volume preparations the facilities for all-out production to meet the nation's yawning demands for motor cars.

Original schedules for 1945 passenger car production called for a maximum output of 241,916 vehicles (THE IRON AGE, June 28, 1945, p. 86). It would appear, in the confusion of these days immediately following cessation of Pacific hostilities, that somewhere upwards of 800,000 vehicles may well be produced this year instead.

Ford, which built 359 in July and plans for about 4000 in August, is in a particularly advantageous position. The River Rouge manufacturer, whose Edgewater plant started up this week, can likely build around 10,000 in September, and by October, when lead time will have been sufficient to increase orders to suppliers, output may well reach up around 75,000. November and December may see the Ford plant coming at a rate upward of 100,000 assemblies in each month. Ford's total alone, therefore, could be in the neighborhood of 300,000 passenger cars, plus possibly 50,000 trucks.

General Motors is not able to move quite as fast. Its first production will begin to come off the lines at Oldsmobile and Pontiac some time during September, and initial tricklings of Chevrolet output may also be manifested then. Although the plans of this largest producer cannot be delineated clearly as yet, it would seem fair to assume that in October GM can turn out somewhere around 30,000 cars, and in November and December more than 100,000 in each month—a total of at least 250,000, plus 50,000 trucks or more.

Chrysler seems to have been lagging in the reconversion race, but her truck output is swinging along in good shape. Probably between cars and trucks the company will be able to turn out somewhere around 150,000 units between now and the end of the year.

The independents all anticipated getting into production some time during September or later, and the ending of the war does not promise to advance their starting dates appreciably. Willys, having started building during July (THE IRON AGE, July 19, 1945, p. 76) may likely turn out 30,000 jeeps or so. Studebaker, Hudson, Nash and Packard may among them account for another 50,000 cars and trucks between now and the end of the year.

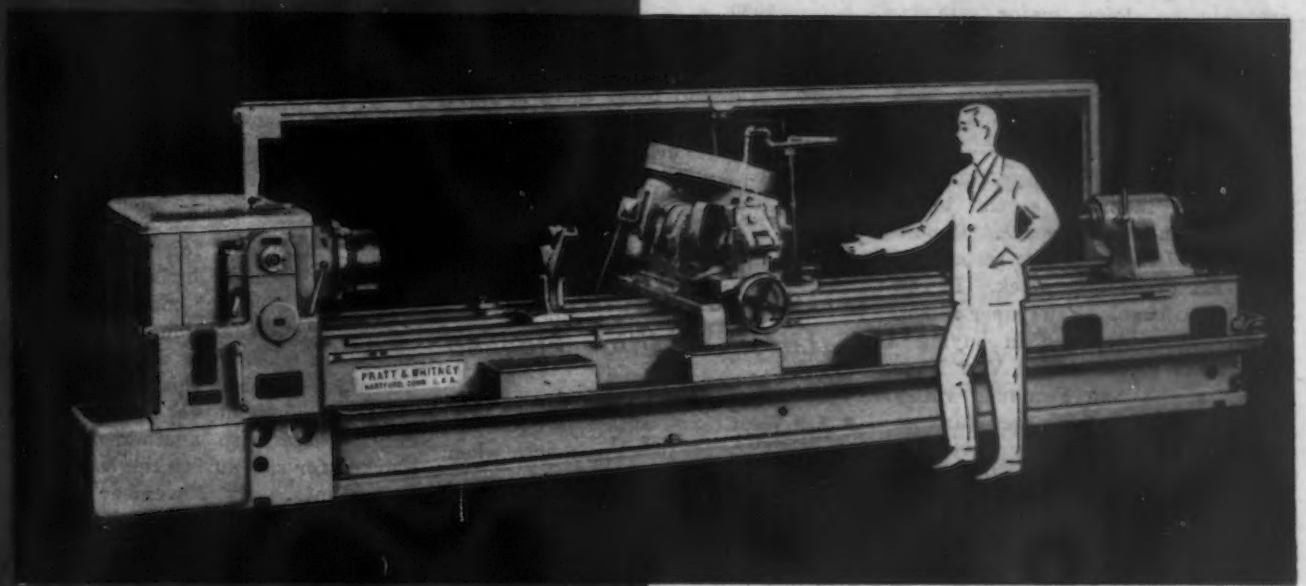
IN total, therefore, major American plants of the industry will be completing somewhere short of 900,000 cars and trucks. Commercial vehicle manufacturing by the firms which build trucks exclusively will be sufficient to bring the total definitely over a million in the civilian vehicle category.

It should be interposed at this point that none of the figures above cited represent settled company anticipations. Things are still too confused in Detroit and other automotive centers to appraise in detailed accuracy the effect of the ending of hostilities.

On the same basis which developed those production forecasts—the logic of the situation—it can be assumed that the auto industry will press for early delivery of machine tools and other manufacturing requirements which will make it possible to move out of the limited output sphere, within those boundaries it has been planning, toward the wider horizons of unlimited manufacturing. This means pressure for deliveries will be on manufacturers of machine tools, tools, heat treating equipment, conveyor equipment and other factory requirements. In all probability military cutbacks will be balanced by at least a few months' work from the automotive industry. Delivery of these needs for unlimited production will make it possible for the auto plants

FOR JAPANESE DELIVERY: *As a safety measure to protect aircraft dropping them from premature explosion of bombs dropped from high altitude a predetermined arming time is built into each M-163 bomb nose fuse for use on all bombs carried by B-29's to blast Japan. Here, a woman employee at the Mansfield, Ohio, works, one of two Westinghouse Electric Appliance Division plants producing these fuses in quantity, holds up a fuse to show the vane by which arming time is controlled.*

NEW!



P&W 12″ UNIVERSAL MODEL "C" THREAD MILLER

Here is Pratt & Whitney's brand new 12″ Universal Model "C" Thread Miller — a powerful, rugged machine suited for all types of thread milling up to 12″ work diameter.

This big machine is built to stand up under hard and continuous use . . . has ample power for cuts as deep as 1⅛″. . . yet the resulting threads are mirror smooth and accurate. The machine swings 27″ over the ways.

Forty work spindle speeds and sixteen cutter spindle speeds provide for a wide range. And in spite of its size, conveniently located controls make it easy to operate.

The machine illustrated is the longest available . . . has a center-to-center distance of 168″. The 12″ Model "C" is also available in sizes with center-to-center distances of 30″, 60″, 90″ and 120″. This newest addition to Pratt & Whitney's long line of machine tools will pay for itself many times over wherever it is used. Write us for complete information.

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to enter the new year geared to produce at a rate somewhere around 500,000 units a month.

Changeover may come earlier than in prewar years, although this prediction, too, is simply hypothesis at this time. The expectation grows out of the fact that all companies will probably be doing major retooling jobs for 1947 models, and will want to be out with them early—which means an earlier than usual shutdown.

MEANWHILE construction of new facilities seems to be modestly increasing pace. General Motors made news in two respects on the West Coast last week. It confirmed Los Angeles newspaper rumors that it was interested in buying a large tract of land near Van Nuys, Calif., in the San Fernando valley. If this deal is consummated (and actually its completion may have been impaired by the premature disclosure) a new Chevrolet plant will probably be built on the West Coast to employ around 5000 workers and supplement the Chevrolet facilities at Oakland. Obviously the volume producer of the General Motors lines has its eye on substantial postwar business west of the Rockies.

The Oakland plant is still under lease to the Army and probably will continue so for at least a few months. In the meantime, facilities for asassembly of Chevrolet trucks is being moved to South Gate (Los Angeles), and assembly of the commercial vehicles will begin there shortly. This will be followed by December with a resumption of production on Buick, Oldsmobile and Pontiac, as in the prewar days.

Further on Chevrolet, reliable information is that Cleveland has tentatively been chosen for assembly of the new low-priced car that maker will offer, probably for the 1947 model season. Buffalo will bulk very large as a supply center for this job. Interest is lent the stories by unconfirmed reports that Chevrolet will build its own bodies for the bottom-layer car, rather than use Fisher facilities in line with the usual General Motors pattern of production.

Any analysis of postwar prospects would not be complete without a look at the apparently huge truck market at hand. To begin with, it may be pointed out that according to newly released Polk figures, national truck registrations decreased only 2.9 pct during the war years, with 4,419,891 trucks licensed last year, as compared with 4,551,726 licensed in 1941. Quite obviously many trucks have continued to be used which ordinarily would have been junked, and as a result the average highway truck is now 7½ yr. old. Nearly 1,800,000 trucks still licensed were manufactured before 1938, and some 173,283 were made before 1929.

Before the war the 1,000,000-truck year was the *ne plus ultra* of the truck world. But today there is probably a backlog of at least 2,000,000 trucks in dire need of replacement, trucks which will be replaced as fast as new vehicles come on the market. By the time that replacement cycle is complete, practically every other truck in operation today will be over age or perilously near it. For practical purposes a backlog of some four years of mass manufacture can be anticipated for the truck industry, and if the uses of trucks continue to expand as they were in the decade before the war the four year backlog may likely extend to six or seven before equilibrium is achieved.

Chevrolet to Assemble Trucks at South Gate; Large Addition Planned

Detroit

• • • West Coast automotive production will resume late this month when Chevrolet starts assembly of trucks at the South Gate (Los Angeles) assembly plant.

This marks the first time South Gate has assembled Chevrolet trucks. Before the war it was a final assembly plant for Buick, Oldsmobile and Pontiac. Indication is that South Gate will continue to be used for Chevrolet truck assembly for some time, inasmuch as the prewar Chevrothe lease terminating at the first of Calif., is under lease to the army. Considerable assembly equipment has been shipped from Oakland for temporary use in a separate operating unit being set up for Chevrolet trucks at South Gate.

Scheduled call for assembly of about 800 trucks during September and about 2700 per month by early November. Resumption of production on Buick, Oldsmobile and Pontiac is scheduled for later this year.

About 175 employees have now been called back, with another 400 earmarked for call during the balance of this month. By November 15 the payroll figure will reach about 1500.

A new addition is being planned to increase floor space from its present 718,000 sq ft to 1,680,000 sq ft. Construction will start late in August, contracts for structural steel, conveyors, ovens, spray booths and air conditioning systems already having been left.

The South Gate plant was built in 1936. It made M-5 light tanks for the army during 1942 and 1943, and was then leased to Douglas Aircraft, the lease terminating at the first of this year. The plant is under the management of Henry L. Clark.

Edgewater N. J. Ford Plant First to Assemble 1946 Car

Edgewater, N. J.

• • • The first 1946 model civilian passenger car built in a branch plant rolled off the assembly line of the local plant of the Ford Motor Co., Monday, Aug. 13. Before the war, Edgewater produced approximately 400 passenger cars a day, and plans are under way to increase output over this figure once restrictions are removed.

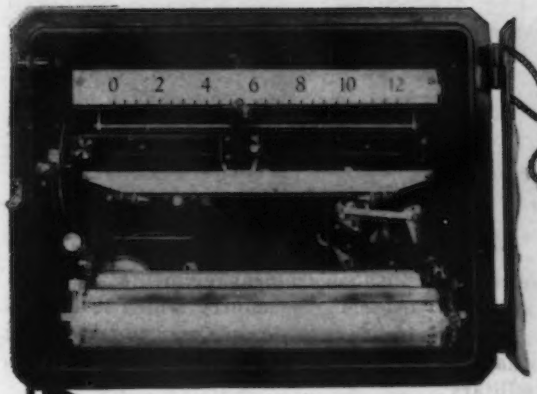
The plant has been turning out war goods since 1942, building and shipping trucks, jeeps and bomber service trucks. Top employment before the war was 3000 persons; more than 2000 are still on the branch plant's payroll. These and others who worked during the war built, boxed and shipped more than 130,000 trucks, jeeps and other military vehicles, beside boxing and shipping more than an estimated 2,750,000 boxes of spare parts.

British Interested in Autos

Detroit

• • • British interest in new car production is high, and the new Austin already is on showroom display, Hugh J. Ferry, vice-president and secretary-treasurer of Packard Motor Car Co. reports following a London visit.

Delivery of the Austin in the United States can be made about October, he was told. Ferry's visit was in the interests of rehabilitating Packard facilities in England, devastated by one of the last V-2 bombs to strike the London area. Rebuilding will start immediately.



How to IMPROVE YOUR PRODUCTS and LOWER UNIT COSTS

REJECTS CUT 50% ON PRECISION INSTRUMENT PARTS WITH CARPENTER STAINLESS

When a manufacturer can improve his product and lower unit costs at one and the same time, his methods bear investigating. Here's the story of a control instrument manufacturer who did just that by switching to uniform, easy-working Carpenter Stainless Steels.

In the first place, parts for temperature control instruments like this must be precision-made to give accurate readings. Second, they must be long wearing to provide years of trouble-free service. Third, they must be corrosion resistant to keep functioning in the face of corrosive industrial fumes and dust.

All signs pointed to Stainless Steel. But *ordinary* Stainless wouldn't do. It had to be Stainless that would machine, blank, and form easily and economically, lot after lot.

You can imagine how pleased the manufacturer was when he found that easy-working Carpenter Stainless Steels not only filled the bill on every count, but *cut rejects in half!*

It just reaffirms a point we've been constantly stressing; you can do it better at lower cost with Carpenter Stainless Steels. Keep this in mind when you plan your new or redesigned products. And remember your nearby Carpenter representative can give you experienced help in selecting the *right* Stainless for the job.

Over 200 parts in this temperature control instrument were precision formed, blanked, stamped and machined from Carpenter Stainless Steels. For easy-to-fabricate Stainless specify Carpenter for your new or redesigned products.

FOR SHORT CUTS to making finer products at less cost, send for your copy of "Working Data for Carpenter Stainless Steels". A note on your company letterhead, indicating your title is all that's necessary.

The Carpenter Steel Company • 121 W. Bern Street • Reading, Pa.

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...for
Strength
Rigidity
Heat Resistance
Corrosion Resistance
Longer Product Life
Sales Appeal

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Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, St. Louis

Washington . . . L. W. MOFFETT

• Time arrived for strong effort toward orderly reconversion . . . Sheet and strip controls free small tonnages . . . French firms use Axis materials.

WASHINGTON — With some justification Congressional committees have criticized executive agencies, particularly the War Department, for not being prepared for reconversion. Undoubtedly the public has to a great degree discounted this criticism. For the primary purpose of the military branches of the government was to win the war as soon as possible. And since this naturally was the overwhelming desire of the nation with its life at stake, the public passed by with an occasional grumble, extravagances in purchasing, over-built inventories, and unnecessary projects that were intended to push the war to a successful conclusion.

Moreover, Congress itself often was looked upon with a suspicious eye. Its hands were far from clean because it has been lax in preparing a legislative reconversion program. It recessed with much of the job left in the lap of the executive branches it criticized.

The fact is, reconversion could not possibly be reduced to an exact science. The ugly nature of war itself makes that impossible. What precise demands may be necessary, could not be foretold. Changes in strategy, technological developments in the field of warfare requiring new instruments with revised and enlarged schedules were frequent in a world struggle that was by far the most savage and widespread mankind has ever seen.

The climactic character of these developments came in the way of the atomic bomb, whose frightful energy, unless controlled or countered by some other miraculous scientific achievement, could threaten civilization itself.

These things being so, what is more natural than that the military went all out for materials of all sorts to throw into the maw of Mars.

In any event, the day has come to forego destructive criticism and to enter upon the period of reconversion in as orderly a fashion as possible. It will be marked by a great deal of confusion and delay, but surely this country as well as the world at large which has passed through a frightful catastrophe of devastation, can negotiate the much less painful path back to peace. It will mean feeding many millions of hungry people abroad, driven to desperation, the supplying of great quantities of materials, credits, and restoration of industrial plants, while at the same time American industry must be converted to peace. In some spots it will be a difficult job, in others such as steel and metalworking it will be relatively simple once the effect of war contract cancellations has been overcome.

There is still another big reconversion problem that must be solved if the country is to get back to peace and prosperity. Labor and management must work in harmony if full employment and ensuing prosperity are to be restored to a war weary world. This, too, in view of organized labor's demands may not be simple but it definitely is necessary.

Enforced excessive wage demands would inevitably lead to skyrocketing prices and unless prices are held to a level of reasonable profits, the country will head into inflation whose terrible portent is secondary only to war itself. Government control of prices, at least on basic products, will continue for some time, but even after they are lifted it is clear a return to government control would be demanded if prices got out of hand. And labor itself, a big factor in prices, would sooner or later find itself under government domination, despite a contrary precedent of the past few years. Woven together, these controls would be expanded until government regimentation would overcome a country which is emerging from a terrible war to crush that very thing.

* * *

WPB investigation of consumer's sheet and strip inventories, which were reduced from 60 to 45 days by Direction 24 to CMP Regulation 2, has reportedly disclosed that around 40 pct of the companies involved were in non-compliance.

However, the quantities of sheet and strip released by order cancellations and deferrals were said to be small when compared with total third quarter usage, and will contribute but little to the easing of the supply situation.

Of the companies investigated in Illinois, Indiana and Wisconsin, 40 pct were found to have inventories in excess of 45-days and order cancellations will account for around 28,000 tons of sheet and strip.

The percentage of manufacturers having excess inventories in Ohio, West Virginia and western Pennsylvania also approximated 40 pct and the quantity of steel involved is estimated at around 20,000 tons. Investigators in Michigan reported 24 companies in excess of permitted inventories by 21,000 tons.

* * *

LARGE quantities of metals and other raw materials seized in Germany are being supplied to French manufacturers who are producing parts and equipment for the U. S. Army, according to Maj. Gen. Henry B. Sayler, Ordnance officer in Europe.

In this manner, French resources are being devoted to essential economic rehabilitation, while at the same time shipment of Ordnance material to the Pacific is being expedited with the parts made by French manufacturers.

Finding these stores made possible the cancellation of contracts for raw materials in other countries. The recent discovery in Germany of 50 tons of antimony enable Ordnance to cancel a large part of a contract with Spain for 85 tons of the metal.

In the area in and near Stolberg,

Basifrit, the original quick setting magnesite, sets in a fraction of the time required for burning in the conventional magnesite-and-slag bottom.

DON'T WAIT FOR HEARTH FAILURE TO CALL THE DOCTOR

LIKE the heart of a man under continued heavy strain, the hearth of a hard driven furnace needs watching and wise care.

So as campaign follows campaign in the great effort to produce all the steel that America must have to win the war, it is "good health insurance" to have a hearth refractories consultant at your call.

Your dependable hearth specialist is the Basic Engineer. He is available and eager to consult with you at all times —on regular maintenance problems, as well as in emergencies. It is his primary duty to help you use the right refractory for each different type of service and to see that those refractories give you maximum value in good performance.

One of the services he is prepared to assist you with, for instance, is in setting up a program of resurfacing open hearth bottoms and banks with Basifrit. He can show you evidence which clearly demonstrates that periodic resurfacing keeps a hearth clean and dependable, and in addition measurably reduces delay time required for between-heat maintenance.

Hearth failure impairs steady open hearth steel production. Don't wait for it to call in the "doctor".

BASIC FURNACE REFRACTORIES

BASIC REFRACTORIES, INCORPORATED 845 HANNA BUILDING *Cleveland 15, Ohio*

Germany, American forces have already shipped to France more than 1400 tons of lead, 800 tons of copper, 500 tons of brass, 430 tons of zinc, 250 tons of aluminum, 8 tons of tin, and nearly 4 tons of magnesium.

Thus Ordnance furnished the materials which are turned over to French manufacturers to replace the raw material they have used in making many critical items for use by the U. S. Armies. Included are 10,000 batteries, 24,700 valves for GMC engines, 145,200 spark plugs, and 18,650 carburetors. The labor for manufacturing is furnished by the French concerns who are paid by the French Government under the Reciprocal Aid Program.

* * *

STEEL mills say it may take a year, according to the contractor, before they can supply 11,000 tons of structural steel and 1600 tons of reinforcing bars for a new assembly plant at Flint, Mich., to cost about $2,000,000, which Chevrolet has been authorized to build without priorities assistance.

Also, without priorities assistance it is not possible to get form lumber. Yet 1000 construction workers are available for the project. Rating assistance would make it possible to complete the project so that it could be open for employment of production workers in August 1946. As the situation exists, however, these workers won't be on the job until the spring of 1947.

* * *

LT. COL. J. M. BARLOW, commanding officer, 7th Light Cavalry Regiment of the British 12th Army in Burma, has reported that his General Stuart light tanks have fought through two years of hard fighting all the way to Rangoon and a large number of the original tanks are still in action.

None of the tanks have become unbattle-worthy in action due to a mechanical defect. Col. Barlow praised American workmanship and design for the efficiency of these vehicles which was maintained over so long and arduous a period of combat and jungle conditions.

o o o

Grants Wage Increase To Soil Pipe Industry

Washington

• • • Estimating 1945 requirements at 330,000 tons, and production at the present rate at only 180,000 tons, WPB declared that critical shortage of cast iron soil pipe is delaying essential construction and necessary repair work. One reason given for curtailed production is shortage of workmen. To bring the cast iron soil pipe industry more in line with other foundries, a wage increase was recently granted in the southern and eastern areas and ceiling prices raised to offset the wage increase.

WPB field offices have been instructed to authorize necessary equipment for improvement of working conditions in cast iron soil pipe foundries. Further efforts to combat manpower shortages include issuance by WPB of an Urgency Production Bulletin stating that "lack of soil pipe is one of the most serious problems in the construction field" and urging that all possible assistance be given by the Production Urgency Committees in establishing urgency ratings for the referral of workers.

FEA Says Supplies To Norway Are Increasing

Washington

• • • Pointing out that Norway, during the three months of her liberation, has made rapid strides toward recovery, FEA recently said that the flow of supplies from the United States to that country is still increasing. The agency had licensed for export almost $20,000,000 worth of steel. South America also is sending supplies to Norway which pays cash for commodities purchased.

Norway also is exporting large quantities of materials, most of which will be used to rebuild industry and agriculture in Europe. FEA said that the metals, minerals and fertilizers that will be available for export during the remainder of the year may run as high as 1,000,000,000 tons, depending on the availability of coal and other materials. In any case, it was stated, 343,000 tons are available for immediate shipment. Among the products being exported are iron ore, copper and copper concentrates, ferroalloy and carbide, molybdenite and nickel.

Copper for Atomic Bomb

New York

• • • It has been reported here that large shipments of copper have been made to Pasco, Wash., and Knoxville, Tenn., under AAA-1 priority during the period of experimentation and manufacture of the atomic bomb.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

INSPECTION COSTS REDUCED TO

PENNIES PER PIECE!

This piston has 9 critical dimensions. Both upper and lower limits of every dimension have to be checked.

This part could be checked by 9 inspectors (one for each dimension) using fixed size gages. Each inspector would then need two gages: one for the GO limit, one for the NO GO limit. That means two operations for each dimension—or 18 operations in all.

With a Multichek one operator inspects *both* limits of *all* dimensions in just one pass, and about as fast as 9 inspectors can check simultaneously one limit of any single dimension. Inspection cost is reduced to a mere fraction of the cost by any other method—pennies per piece.

That's not all. The Multichek, because of its inherent mechanical accuracy and positive electrical speed, eliminates the element of human error. No highly developed sense of feel is required to check to a high degree of accuracy. Furthermore, full manufacturing tolerances may be utilized. Multicheks may be used at the machine to control the process, to tell the operator "where he is" and which way "the machine is going"—or they can be used at any inspection station.

May we analyze your requirements and quote on Multicheks for checking from two to twenty or more dimensions simultaneously in one quick pass, thus reducing production costs to a minimum.

THE **SHEFFIELD** CORPORATION

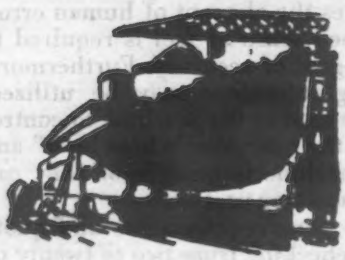
Dayton 1, Ohio, U.S.A.

MACHINE TOOLS · GAGES · MEASURING INSTRUMENTS · CONTRACT SERVICES

West Coast . . .

OSGOOD MURDOCK

• Hundred pct cancellations on V-J Day for some military contracts, maintenance and some consumer goods to remain tight . . . U. S. Steel throws Geneva back in Washington's lap . . . Atom bomb may reduce future size of bombers.



SAN FRANCISCO — Army and Navy purchasing offices here have manuals of instructions for VJ-Day face up on the desks of most commanding officers who say, "Now businessmen know why we've been conducting contract termination schools all this time."

Page and verse references to these manuals are still expected to be released from Washington, D. C., rather than locally. However OIC's, anxious to do what they can to clarify the immediate prospects—in spite of the restricted imprint on the instructions —say that they are just about what anyone might expect.

Cancellations will fall into three types of products. The A classification, largely heavy industry products needed for large scale warfare, may expect almost immediate complete cancellations. Class B and C products are those which the military may conceivably continue to need in one quantity or another. Degree of cancellations for these will probably range variously from 10 to 90 pct. Best method for a manufacturer to figure his prospects in advance of notification, officials say, is to sit back, put his feet on his desk and guess what kind of military activity will follow surrender. Any industrialist may be just as good a guesser as the military experts.

The West Coast, having been less affected by termination of the European War, will obviously feel the effects of termination of the Pacific to a greater degree than will the East, they point out, but go on to say that the Navy and War Shipping Agency have a huge backlog of maintenance and repair of materiel whereas the Army's job consists more of maintaining personnel. Guided by these factors, industry operators can pretty well judge their prospects for themselves.

On the other hand, a chief executive in one principal regional war agency expects so little immediate development after peace is announced that he has left to combine business with vacation and make a two or three week field inspection trip.

* * *

ONE former uncertainty became definite and one variable was at least provisionally solved in the complicated, absorbing equation of far western postwar steel production with announcement last week by the United States Steel Corp. that under prevailing circumstances and in the present political situation governing the disposal of the Geneva plant in Utah, it felt unable to bid for the purchase thereof.

The Corporation, through its subsidiary Columbia Steel Co., has signified its intention to install cold reduction facilities in its Pittsburg, Cal., plant on upper San Francisco Bay with an annual capacity of more than 325,000 tons of sheets and tin plates at an initial expense of approximately $25 million. No definite announcement of increased blast furnace or open-hearth ingot capacity has been made except for the inference that Columbia would become a substantial customer of the postwar operator at Geneva for this approximate quantity of ingots or hot rolled coiled strip.

Reaction to this important commitment on the Pacific Coast has been immediate and varied. Everyone welcomes a clearing of the murky atmosphere in any direction. This substantial investment by the leading national producer is a gratifying recognition of the future industrial importance of the far western market. "The fact that the Corporation will center its western production on the Pacific Coast is probably due to the high freight rates on finished steel products from Geneva to Coast markets," declares Kenneth T. Norris, chairman of the coastwide steel committee of the Western States Council. "Transportation costs on finished steel from Geneva to Coast points will now certainly have to be adjusted downward from pre-war levels, if Geneva is to operate successfully." Mr. Norris believes, therefore, and many of his associates among independent fabricators and major far western customers for steel products agree with him, that their prime objective, a lower differential applying to Pacific Coast basing point prices, is at least a little nearer of achievement.

In Utah the announcement was received with surprise, shock and consternation, since United States Steel has consistently been the favored final operator throughout that state. Its subsidiary, Columbia, has long operated congenially at Provo, and Walther Mathesius, in charge of the operation of the Geneva Steel Co. since the erection of the mill by Columbia for the government, has gained the confidence and respect of his new Utah neighbors.

However, political and industrial leaders in Utah immediately laid plans to back other possible purchasers and/or operators of Geneva, and Colorado Fuel and Iron Co. seemed immediately to become the Number One candidate. One industrialist commented that "The politicians built Geneva and then kicked it around as far as its postwar operations were concerned. Now United States Steel has thrown Geneva right back into the politicians' laps."

Charles Allen Jr., C. F. & I. chairman, was locally quoted as follows: "We are still of the opinion that if Geneva Steel plans to remain in business Colorado Fuel and Iron Co. is the logical operator because of its western steel experience, its established sales outlets and organization, and also because of its mineral resources in the state of Utah. With the aid and cooperation of various government agencies involved, we are continuing to make every effort to formulate a workable plan."

John M. Wallace of the Salt Lake Walker Bank and Trust Co. and Gus P. Beckman, secretary of the local chamber of commerce, both members of the Western States Council's steel committee, made the following joint

Output of Parachute Snaps boosted 2000 per day with TOCCO

LETTS DROP FORGE COMPANY, Detroit, Michigan, converted its heating for forging of parachute snaps from combustion type furnace to TOCCO Localized Induction Heating and got these results:

91% MORE OUTPUT. Formerly produced 2200 snaps per day. One TOCCO Machine heats one snap every 7 seconds—4200 per day.

PERFECT SHAPE. Formerly, when heated all over, bottom flange twisted when upper portion was forged. Scrap loss was high. TOCCO heats only portion to be forged; flange retains its shape. Scrap now is nil.

DIE LIFE INCREASED 77%. Speedy, localized TOCCO heating minimizes scale; increases die life from 18,000 to 32,000 pieces.

UNIFORM QUALITY. Guesswork eliminated. TOCCO's accurately controlled heating assures absolute uniformity of every snap.

EASY DOES IT. Formerly required two men; now one. All he does is load and unload TOCCO's work feeder. TOCCO's freedom from radiant heat and gasses improves working conditions.

Investigate TOCCO for *your* heating operations. "Results with TOCCO", free on request.

THE OHIO CRANKSHAFT COMPANY · Cleveland 1, Ohio

TOCCO

INDUCTION

HARDENING, BRAZING

ANNEALING, HEATING

statement: "Utah people will give the Colorado Fuel and Iron Co. as bidders for Geneva their enthusiastic support to the end that Utah may enjoy to the fullest extent possible a completely integrated steel industry."

Summarizing Provo's point of view, President Clifton A. Tolboe of the chamber of commerce there expressed high regard for both United States Steel Corp. and C. F. & I. and stated that he "regretted the withdrawal of any company such as one of these from the list of potential operators." Utah continues earnest in the belief that the Geneva plant can and will be successfully operated by people of the steel industry but feels the government must speed the leasing of the plant for peacetime operation.

Immediately following the announcement of United States Steel's decision, Henry J. Kaiser was asked whether the news affected his plans. "It will not in the least lessen our drive to establish a permanent, independent, integrated western steel industry. I have persistently declared my faith in competition. It is the very heart of the American system of free enterprise, but competition must be conducted according to the rules of fair play."

In all probability the termination of trans-Pacific hostilities will immediately cancel present orders for plates at Geneva and cause the imminent shutdown of open hearths and rolling mills. Without Geneva's blast furnaces Pacific coast open hearths and foundries will probably again be short of pig iron, at least temporarily. The little old, efficient 600-ton Provo No. 1 furnace of Columbia Steel has miraculously operated at capacity for three or four years without relining and must soon be released for rest and refreshment over several months period. The Fontana Kaiser furnace may take up part of the slack, but so far very little iron from that source has been sold on the West Coast market and unless Fontana's rolling schedules in the structural, plate and merchant mills are curtailed no consistent pig surplus can be counted on for the open market.

* * *

RELEASE of the first atomic bomb over Japan simultaneously released a $350 million secret in the state of Washington that has been so close and so closely held that the population has been fascinated.

It now develops that when work commenced in April, 1943, under DuPont management there were 1500 construction employees. At the peak 45,000 construction workers and 6,000 service employees were engaged. Construction was completed on schedule February 10, 1945. A working force of 17,000 now resident at Richland, a few miles north of Pasco, operates the project. It is announced that the Hanford (officially up to now Manhattan) Project and its counterpart in Tennessee operate independently and if either were closed down the other could produce the material although each by a divergent process. The site was selected on the plains of interior Washington along the arid Columbia River because of the availability of huge quantities of government generated electric power, an abundance of pure water, isolation and cheap land. There is common belief that items other than the U-235 uranium used in the present process can be utilized as research progresses. The project was not built with the idea of being part of any projected Columbia River development.

Seven scattered plants are separated by several miles from each other. The first processes raw material; three are used for primary production; the last three chemically treat the material. Buildings are solid concrete structures 800 feet long, 60 feet high and 80 feet wide. They have foundations 356 feet deep. Though the plants have no one living near them they have been operated around the clock during production. Authorities state the atomic substance requires special mechanism to set it off and is not dangerous to work with.

Military aircraft design in the future may be radically affected by atomic tactics. The bomb, it is believed, is fairly light, perhaps around 400 pounds. The B-29 Superfortress is designed to carry 10 tons. Henceforth such huge bombers may not be needed and as commercial planes continue to grow in size military bombing planes in the future may shrink as they speed.

* * *

AMONG the first Coast firms to recognize the full implications of the atomic bomb was Ryan Aeronautical Co. Vying with the atom bomb for attention, Ryan disclosed assurances from the Navy of continued production of their new, and to date secret, combat plane. Simultaneously the company put into effect an employee profit sharing plan. Approximately 10 pct of the company's net will be set aside in a retirement fund for salaried employees. After a full year's employment any worker on a monthly salary becomes eligible for payments toward which he has contributed nothing more than his work.

* * *

Andrew Jackson Higgins, continuing his sweep up the Pacific Coast, has consummated arrangements with architect Maury Diggs of Oakland to enter the field of pre-fabricated housing on a mass production scale.

Using a patented insulating material developed by Mr. Diggs, the units will be made of four by eight foot, 16 gauge enamel coated steel. Mr. Higgins says that the houses can be sold at a price less than that of a Class two dwelling today. After the foundation is laid two men can erect one of the dwellings in two days.

* * *

Western industry is launching a program for a $5 million endowed Pacific Research Foundation. A favored project of Harrison Robinson, initial organization work is being conducted by Morlan A. Visel, Dr. Maurice Nelles and E. L. Black. Headquarters are at 417 So. Hill St., Los Angeles.

Cited for Awards

• • • The following companies have received Army-Navy "E" awards for outstanding war production:

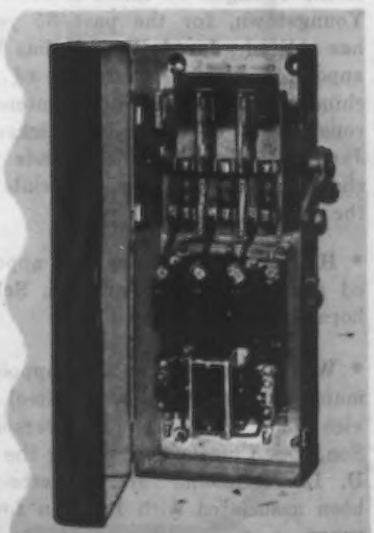
Mullins Mfg. Corp., Salem plant, Salem, Ohio (fourth star)
Radio Receptor Co., Inc., New York (third star)
Yale & Towne Mfg. Co., Philadelphia Div. (second star)
Southern Aircraft Corp., Garland, Tex. (first star)
Connors Steel Co., Birmingham, Ala. (first star)
Albert Lea Foundry Co., Queen Stove Works, Inc., Albert Lea, Minn.
Anaconda Wire & Cable Co., Anderson, Ind.
Anderson Aircraft, Inc., New York.
Apollo Mfg. Co., Newark, N. J.
Automatic Machine Products Co., Birmingham, Ala.
Bachmann Brothers, Inc., Philadelphia.
Barr Mfg. Corp., Weedsport, N. Y.
W. A. Barrows Porcelain Enameling Co., Cincinnati.
Benwood Linze Co. & B-L Electric Mfg. Co., St. Louis, Mo.
Bright Star Battery Co., Clifton, N. J.
Buchanan Steel Products Corp., Buchanan, Mich.
Char-Lynn Co., Minneapolis.
Crystal Mfg. Co., Chicago.
Cuyahoga Spring Co., Cleveland.
Dodge, Inc., Los Angeles.
E. I. du Pont de Nemours & Co., Industrial Div., Doyle Works, Leominster, Mass.
Fanger Research & Mfg. Co., San Francisco, Calif.
Lenk Mfg. Co., Newton, Mass.
Link-Belt Speeder Corp., Link-Belt Co., Cedar Rapids, Iowa.
A. Mamaux & Son, Pittsburgh.
Monroe Ordnance, Inc., Rochester, N. Y.
Northrop Aircraft, Inc., Hawthorne, Calif.
Permanente Metals Corp., Carbothermic plant, Permanente, Calif.
Rahaim Machine & Tool Co., Gardner, Mass.
E. T. Rugg Co., Newark, Ohio.
Schlueter Mfg. Co., St. Louis, Mo.
William Skinner & Sons, Holyoke, Mass.
Stein Brothers Mfg. Co., Chicago.

3 important advantages in this installation of Square D Combination Starters

SAVES TIME Disconnect Switch and Magnetic Starter are housed in one enclosure—thus saving mounting and wiring time.

CONSERVES SPACE Square D Combination Starters require substantially less space than individually mounted switches and starters.

INCREASES SAFETY The cover of the enclosure is interlocked with the operating handle of the disconnect. Thus, the cover cannot be opened on a "live" starter.



Write for Bulletin 8538 which gives details and illustrations of complete line. Address Industrial Controller Division, Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

PERSONALS

STANLEY E. JOHNSON, vice-president, Cooper-Bessemer Corp.

• **Stanley E. Johnson**, general sales manager of The Cooper-Bessemer Corp., Mt. Vernon, Ohio, has been elected a vice-president and member of the board of directors and **Charles G. Cooper**, manager of the company's Washington office, has also been elected to membership on the board. Mr. Johnson has been with the corporation since 1918 beginning his career as a member of the sales department. Mr. Cooper joined the New York office as a sales engineer in 1931 and in 1933 established and became manager of the Washington office.

• **Charles T. Moke**, purchasing agent of the Youngstown Sheet & Tube Co., Youngstown, for the past 35 years, has retired. **Jared F. Cone** has been appointed purchasing agent of machinery, construction and maintenance repair and operating supplies, and **James D. Sloan** has been made purchasing agent of raw materials for the company.

• **H. J. von Plonski** has been appointed general manager of Wm. Schollhorn Co., New Haven.

• **Wayne Dukette** has been appointed manager of the Cincinnati Steel-Service plant of Joseph T. Ryerson & Son, Inc., Chicago, succeeding the late D. L. McCubbin. Mr. Dukette has been associated with Ryerson for 31 years.

• **Ward Dougherty** has been appointed manager of the export department, Machine Div., Osborn Mfg. Co., Cleveland. Mr. Dougherty was formerly manager of the Machine Div. contract department.

• **R. A. Williams** has been elected executive vice-president and a director, American Car & Foundry Export Co., New York. Mr. Williams is also vice-president in charge of sales of American Car & Foundry Co.

• **Dr. Lauchlin M. Currie** has been elected vice-president in charge of research of National Carbon Co., Inc., Cleveland. Dr. Currie has been acting director of research since 1942, except for 15 months during which he was associate director of the Division of War Research of Columbia University.

• **Fleming E. Jamieson**, manager of orders of the Jones & Laughlin Steel Corp., Pittsburgh, since 1913, has retired. **Frederick H. Lewis** has succeeded Mr. Jamieson.

• **A. G. Bussmann** and **L. D. Granger** have been elected vice-presidents of the Wickwire Spencer Metallurgical Corp., Newark, N. J. Mr. Bussmann is also vice-president in charge of sales of the Wickwire Spencer Steel Co. Mr. Granger has previously been assistant to the executive vice-president of the Wickwire Spencer Metallurgical Corp. He is also vice-president of the American Wire Fabrics Corp., another Wickwire Spencer subsidiary.

• **Irving B. Babcock**, president of the Aviation Corp., has been elected president of the Crosley Corp., Cincinnati. Mr. Babcock is also chairman of the boards of Consolidated Vultee Aircraft and American Central Mfg. corporations, two other associated Avco companies.

• **Paul W. Pheneger** has been appointed general superintendent of Michigan Seamless Tube Co., South Lyon, Mich. Mr. Pheneger was previously employed by the Spang Chalfant Div., National Supply Co., Pittsburgh.

• **Earnshaw Cook**, chief metallurgist of the American Brake Shoe Co., New York, plans to retire from active practice of metallurgy, Jan. 1, 1946. He will continue in a consulting capacity with the company and will also engage in general consulting work on steel mill and foundry problems. **Raymond H. Schaefer**, first assistant to Mr. Cook at the American Brake Shoe Co. will succeed him as chief metallurgist of the company.

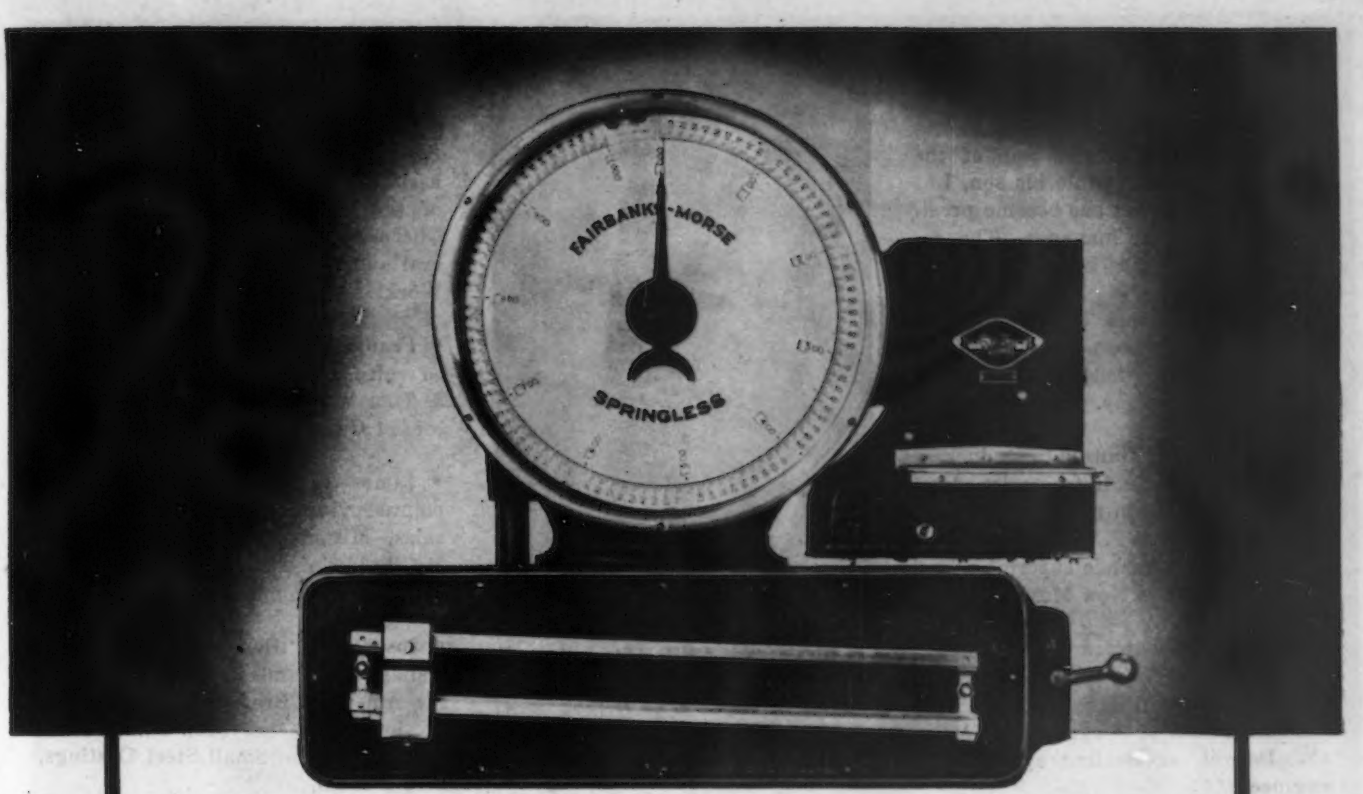
ROBERT C. COWAN, district manager of sales in Philadelphia, Columbia Steel & Shafting Co.

• **Robert C. Cowan** has been appointed district manager of sales in Philadelphia for Columbia Steel & Shafting Co., Pittsburgh. Mr. Cowan has been Philadelphia manager for four years for Edgar T. Ward's Sons Co. and Summerill Tubing Co., both affiliated companies of Columbia Steel & Shafting Co. His appointment consolidates the managerial responsibility of the three affiliated companies at Philadelphia. Mr. Cowan was formerly with Jones & Laughlin Steel Corp. in a sales capacity for 17 years and later was manager of the steel warehouse department, Pittsburgh Bridge & Iron Works. **S. P. Davies**, former Philadelphia manager, has resigned to accept a position with Richmond Engineering Co., Richmond, Va.

• **Robert V. Lackner**, formerly with Carnegie-Illinois, Duquesne Works, has been named field engineer for the Allis-Chalmers Mfg. Co.'s Pittsburgh district office.

• **Charles H. Saiter** has been appointed sales manager in charge of the newly established Heavy Machine Div., Cleveland Crane & Engineering Co., Wickliffe, Ohio.

• **Raymond J. Purdy**, vice-president and treasurer of Ainsworth Mfg. Corp., Detroit, has been elected president and general manager, succeeding the late Charles H. Ainsworth. **E. O. Christiansen**, factory manager since 1930, has been elected first vice-president, and **G. A. Ellerthorpe**, secretary since 1933, was elected secretary-treasurer.



A name worth remembering

FAIRBANKS-MORSE

Fairbanks-Morse is the name to think of first when you need scales. For 115 years Fairbanks-Morse Scales have met the varied and increasing needs of business. They have won the confidence of buyers and sellers . . . labor and management, because Fairbanks-Morse has always built accurate scales and is constantly working to improve them.

BUY AND HOLD MORE WAR BONDS

SCALES

FAIRBANKS, MORSE & CO.
CHICAGO 5, ILLINOIS

DIESEL LOCOMOTIVES • DIESEL ENGINES • GENERATORS • MOTORS • PUMPS • SCALES

MAGNETOS • STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT

• **H. B. Kraut** has resigned as president and general manager of Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., because of ill health. He has been appointed chairman of the board of directors, while his son, **Lt.-Col. Ralph J. Kraut** has become president and general manager. The retiring president has been active head of the Giddings & Lewis company since 1924. Colonel Kraut, the new president and general manager, has recently been released from active duty with the U. S. Army.

• **Norman E. Hanson,** production manager of Basic Refractories, Inc., Cleveland, has been made assistant to president Howard P. Eells, Jr. G. W. Nielson has been made superintendent of Basic plants in New Mexico.

• **Foster R. Woodward,** recently welding engineer with Westinghouse Electric Corp., East Pittsburgh, Pa., has joined the staff of Progressive Welder Co., Detroit, as welding applications engineer.

• **Ralph K. Carson** has been appointed sales engineer at the Detroit branch of the Heppenstall Co., Pittsburgh. Mr. Carson has succeeded **James C. Patton, Jr.,** who recently became district sales representative for the company in Chicago.

• **Earl A. Taylor** has been appointed general works manager of the Automotive Div., Crosley Corp., Cincinnati.

• **Lt. Harvey Picker,** recently returned to inactive status by the Navy, has been elected president of the Picker X-Ray Corp., New York.

• **Charles E. Dixon, Jr.,** chemical engineer, formerly with Turco Products, Inc., has been appointed vice-president and general manager of the Western Div., Phillips Chemical Co., Chicago. **Dr. Meyer Agruss** has been made national general manager.

• **Rollin D. Hager** has been named general superintendent of the Industrial Products Div., B. F. Goodrich Co., Akron, succeeding **G. L. Matthias,** who has retired because of illness. **H. L. Dixon** has been appointed to Mr. Hager's previous post as production manager of the division, and **E. L. Slingluff** will succeed Mr. Dixon as manager of reclaim manufacturing.

• **Carl G. Nesbitt,** formerly sales manager of the household line, Continental Can Co., New York, has been appointed manager of war products sales for the company.

WILLIAM MILLER, Pittsburgh district sales manager, Jones & Laughlin Steel Corp.

• **William Miller,** an assistant general manager of sales of Jones & Laughlin Steel Corp., Pittsburgh, has been placed in charge of Pittsburgh district sales, succeeding the late V. A. Jevon. Mr. Miller has been with J&L for 30 years, serving in various sales capacities.

• **Edward Van der Pyl** has been appointed superintendent of the Norbide plant of Norton Co., Worcester, Mass.

• **Karl B. McEachron,** man-made lightning expert, has been made assistant works manager of the General Electric Co., Pittsfield, Mass., plant, and **Horace S. Hubbard,** design engineer has succeeded Mr. McEachron.

• **F. A. Wright** has been appointed assistant general sales manager, Cutler Hammer, Inc., Milwaukee.

• **Fred W. Eiselstein** has been appointed to the newly created position of general traffic manager, U. S. Steel Supply Co., Chicago. Until recently, he had been associated with the Office of Defense Transportation.

• **Dr. J. T. Rettaliata,** manager of research and gas turbine development for Allis-Chalmers Mfg. Co., Milwaukee, has been named chairman of the mechanical engineering department at Illinois Institute of Technology, Chicago.

• **J. A. Civilett** has been appointed assistant resident representative of Westinghouse Electric International Co., East Pittsburgh, Pa.

• **E. R. Haan** has been appointed director of advertising of the DoALL Co., Des Plaines, Ill.

• **Menno Felber** has been appointed works manager of the Milwaukee Works, International Harvester Co., Chicago. Mr. Felber has succeeded **R. E. Bloye,** who has been appointed assistant manager of manufacturing of the Industrial Power Div. **J. E. Obernesser** has been appointed general superintendent of the Milwaukee Works.

• **Franklin A. Reed** has been appointed sales manager, Niagara Machine & Tool Works, Buffalo. He has succeeded **George R. Kinney,** resigned.

• **James F. Baldwin** has been appointed vice-president in charge of sales, Milton Mfg. Co., Milton, Pa. Mr. Baldwin was formerly with the American Locomotive Co.

• **Joseph J. Glass,** formerly plant manager and sales representative of the American Brake Shoe & Foundry Co. in Buffalo, has been named sales manager of the Small Steel Castings, Inc., Buffalo.

• **H. B. Leidy** has been named manager of the Middle Atlantic district Mfg. & Repair Dept., Westinghouse Electric Corp., East Pittsburgh, Pa. **R. J. Miller,** formerly acting manager of the department, has been transferred to Emeryville, Calif., as assistant manager of the Pacific Coast district M. & R. Dept., and **H. E. MacArthur** has been made manager of the Huntington, W. Va., branch.

• **Charles H. Augspurger** has been appointed public relations director of the Airplane Div., Curtiss-Wright Corp., Buffalo, succeeding **A. D. Palmer, Jr.,** who has resigned.

• **George R. Sommers** has become Pacific Coast sales manager, the Lighting Div., Sylvania Electric Products, Inc., Ipswich, Mass.

OBITUARY...

• **John T. Booth,** department superintendent and a veteran of nearly 50 years with National Malleable & Steel Castings Co., Cleveland, died July 29.

• **J. Russell Garrison,** president and general manager of the Garrison Machine Works, Inc., Dayton, died recently.

• **Otto F. Faber,** chief engineer of the George L. Squire Co., a division of the Buffalo Forge Co., Buffalo, died August 2.

STEEL CASTINGS BY PSF

get a good start in life....

From lip to tilting lugs, these 300-cubic foot "mill-design" Slag Pots have the uniform grain structure and sound strength needed for long life in tough service. Whether the customer's design or our own, all PSF castings are the product of advanced foundry methods, laboratory techniques, and finishing equipment. Let us enlist these modern steel casting facilities on your side.

47 YEARS OF STEEL CASTING KNOWLEDGE

Pittsburgh STEEL FOUNDRY CORPORATION

GLASSPORT, PA. Pittsburgh Spring and Steel Division, Pittsburgh, Pa.

W & D 9866

Sales Offices: NEW YORK • PHILADELPHIA • CHICAGO • CLEVELAND • CINCINNATI • AKRON • WASHINGTON • ST. PAUL • SAN FRANCISCO

Dear Editor:

TWO VIEWPOINTS

Sir:

The writer was smitten by the Bull o' the Woods cartoon that appeared in THE IRON AGE for July 12. The story as told in the cartoon is so typical of numerous incidents that have occurred at our plant that we are wondering whether it is possible to obtain the original drawing or a large clear copy of it for mounting on our bulletin board.

DANIEL D. WHYTE,
President
Whyte Mfg. Co.,
115 Fourth Ave., New York

● We cannot send the original, but a photostatic copy of the cartoon has been mailed.—Ed.

LEAD APPLICATIONS

Sir:

Please send me three copies of "Lead Coated Steels Appraised," and "Producing Frangible Plastic Bullets," from the May 24 issue.

ALFRED P. KNAPP,
General Manager
American Smelting and Refining Co.,
120 Broadway, New York 5

● Tear sheets have been mailed.—Ed.

PRECISION CASTING

Sir:

I have read with much interest the seven articles in your pamphlet, "Precision Casting." This is an excellent survey of a timely subject, and I hope you will apply this method of reprinting groups of related articles in pamphlet form to other subjects where sufficient interest is shown. To supplement the pamphlet on precision casting I should like to have tear sheets of two more recent articles on this subject if available: Gott, L. W.—"Precision Casting of Low Alloy Steels," June 21; Morey, W. A.—"High Reproducibility in Precision Casting," May 10 issue.

WM. W. AUSTIN, JR.,
Metallurgist
Southern Research Institute,
Birmingham 5, Ala.

● Within the limitations of the paper shortage we have been reprinting selections of related articles wherever appreciable interest is evidenced. A second reprinting of the precision casting articles includes all nine articles published to date, copies of which are available at 60¢ each.—Ed .

WELDING ROD SUPPLIERS

Sir:

Would you kindly furnish me with a list of the manufacturers of welding rods, or advise where I can procure same.

HARRY F. HESS
U. S. Naval Hospital,
New Orleans, La.

● A reprint of "Comparable Arc Welding Electrodes" which lists producers has been mailed.—Ed.

TANGENT BENDER

Sir:

Would you inform us of any company that manufactures a tangent bender similar to the Struthers Wells product.

M. HANNAFORD
Williams & Wilson, Ltd.,
544 Inspector St., Montreal

● The Cyril J. Bath Co., Cleveland, produces such equipment which is described in an article "Combining Stretch and Pressure in Contour Forming" from the Dec. 7 issue. —Ed.

RUST PREVENTIVES

Sir:

Please send us tear sheets of the article "Specifying Rust Preventives" by J. Albin in the June 7 issue.

K. B. VALENTINE
Engineer, Metal Treatment and Finishes
Pontiac Motor Division,
Pontiac 11, Mich.

Sir:

Kindly send me a set of tear sheets.

J. W. DONAHUE,
Tube Engineer
Raytheon Mfg. Co.,
Waltham, Mass.

● Tear sheets have been mailed.—Ed.

WELD DISTORTION

Sir:

Would you forward a copy of the article, "Control of Distortion in Arc Welding," in the June 28 issue?

W. E. HODGSON,
Metallurgical Engineer
Canadian General Electric Co., Ltd.,
Toronto, Ontario

● Tear sheets have been mailed.—Ed.

SHACKLE STANDARDS

Sir:

I should like to receive two reprints of the article, "Standardization of Shackles," from the July 12 issue.

J. T. O'CONNOR,
Asst. Mgr. of Sales
Carnegie-Illinois Steel Corp.,
Pittsburgh 30

● Tear sheets mailed.—Ed.

TEXAS STEEL

Sir:

There appears in the June 28 issue an article entitled, "Texas Steel," by Charles T. Post. If available, we would appreciate two copies of this article.

H. W. LINHARDT,
Superintendent, Blast Furnace
Winnequa Works,
Pueblo, Colo.

● Reprints have been mailed.—Ed.

HIGH SPEED CUTTING

Sir:

I would appreciate receiving two copies of the article, "Super High Speed Cutting of Metals," by Prof. V. D. Kuznetsov, which appeared in the May 10 issue.

CHARLES A. PETHYBRIDGE,
Chief Metallurgist
New Britain-Gridley Machine Division
New Britain, Conn.

● Tear sheets sent.—Ed.

TAP GRADING

Sir:

I would like to have 50 copies of the article appearing in the Dec. 28 issue, entitled, "Tap Grading System Reduces Scrapped Threads."

CYRIL D. SAVAGE,
Tap Grading Dept.
Wright Aeronautical Corp.,
Paterson 3, N. J.

● Sorry, reprints have not been made, but are mailing tear sheets.—Ed.

ANNEALING STEEL

Sir:

Please send me three copies of "The Annealing of Steel," by Peter Payson, published in 1943.

WALTER B. FARNSWORTH
Assistant Works Manager and Chief Metallurgist
Pittsburgh Steel Co.,
Monessen, Pa.

● Reprints have been mailed.—Ed.

DPC STEEL PLANT STUDY

Sir:

Enclosed please find 10c to send me a copy of the report on the "Disposal of Iron and Steel Plants," which was prepared for the Senate Military Affairs Committee.

BENJAMIN SCHWARTZ,
Executive Vice-President
New York Commodities Corp.,
60 Broad Street, New York 4

Sir:

Enclosed find ten cents. . . .

DONALD E. RODA,
Chief Metallurgist
Pacific Division Bendix Aviation Corp.,
North Hollywood, Calif.

● Reprints have been sent.—Ed.

BERYLLIUM COPPER

Sir:

Within the last few months you have published some information on the resistance of beryllium copper alloys to abrasion and corrosion. Would you forward tear sheets?

H. FREEMAN,
Technical Director
Consolidated Paper Corp., Ltd.,
Three Rivers, P. Q.

● Tear sheets have been mailed.—Ed.

THREAD ROLLING

Sir:

Will you send us three complete copies of the reprint, "An Appraisal of Precision Thread Rolling Practice." We are enclosing herewith 75c to cover cost of same.

D. W. LEACH
Champion Gauge and Tool Co.,
Detroit 1

● Reprints have been mailed.—Ed.

"Some Trolley Ride those springs take!"

A MUCH-IMPRESSED visitor to the Muehlhausen hot-coiling plant made this comment after inspecting the enameling and baking "station" shown below—the "end of the line" for thousands of springs each day.

This mechanized process is typical of the streamlined set-up in the Muehlhausen hot-coil plant, which is devoted entirely to producing large springs.

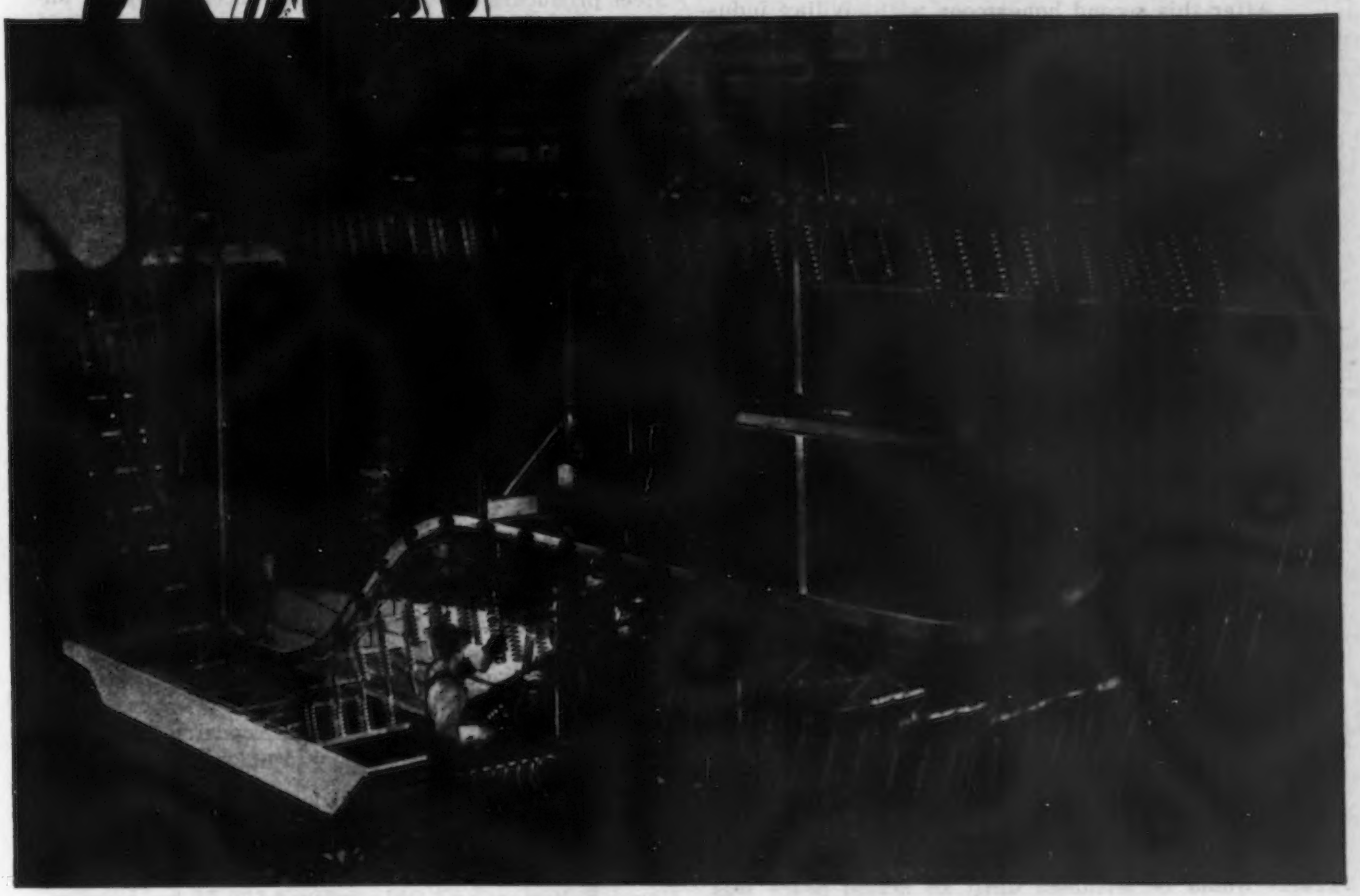
Specialized equipment, such as *automatic* hot-coiling machines, *block-long* heat-treating lines, *precision* grinding facilities, all on a smooth running production-line basis, assures Muehlhausen customers of quick delivery on large springs of *any design,* in *any quantity,* and to *split-hair tolerances.*

Check with Muehlhausen on your large spring problem—your production schedule and product both will benefit!

MUEHLHAUSEN SPRING CORPORATION

Division of Standard Steel Spring Company

817 MICHIGAN AVENUE • LOGANSPORT, INDIANA



To improve product performance, use

MUEHLHAUSEN Designed SPRINGS

WRITE FOR LARGE SPRING FOLDER!

Showing the extensive facilities at Muehlhausen for making large springs.

This Industrial Week . . .

- **Industry Marks Time While Awaiting Announcement**
- **Sheet Users See Comparatively Bright Future**
- **Mills Expect 48 Hr Rolling Break**

WITH an attitude of subdued expectancy, industry is marking time; and although chaotic conditions seem in the offing, sudden reconversion held no terrors for the steel industry this week.

While war contractors struggled with the specter of terminations, and war converted manufacturers rushed to get the mothballs out of their civilian clothes, from four to six months' near capacity operations seemed assured for full line steel producers on the basis of civilian orders now in their pockets.

After this second honeymoon with civilian industry, there was further prospect that as reconversion was accomplished and productive capacity dusted off additional orders would be forthcoming to replenish backlogs as they are nibbled away.

Order departments took the initial peace negotiations calmly, with few cancellations received in the early part of the week. Customers seemed reluctant to anticipate contract cancellations until they were actually received. On this basis it appeared that approximately 48 hrs would be required from the falling of the contractual axe at Washington before repercussions were felt on mill schedules.

LAST week's atomic bomb raids and the entry of the U.S.S.R. into the war were reflected in decreased war steel orders accentuating a trend visible since V-E Day. Civilian customers likewise moved with caution and nonpriority orders deviated but little from the level of recent weeks. Combined war and civilian ordering amounted to approximately 40 pct of the weekly volume entering the books during the peak buying period early this year.

Despite strong pressure from civilian customers impatient to resume production—noticeably the automotive industry—extended deliveries quoted through the early part of this week indicated that final capitulation alone would light the fuse to blast war orders backlogs. Government sources indicated that acceptance of the modified Potsdam ultimatum alone would not suffice to order the cancellations from the purchasing divisions. It was indicated instead that the telegrams would be withheld until an actual peace was signed with Japanese officials.

Then, automotive, appliance, farm equipment, railroad equipment and other essential civilian industries whose orders long have lain dormant appeared in the best position to benefit by the initial break. Automobile manufacturers were talking in terms of from 500,000 to 800,000 passenger cars this year compared to the 250,000 originally scheduled, and farm machinery makers were planning double present production.

Steel warehouses, which have been a major source for civilian manufacturers unable to find a place on mill schedules, and whose inventories have been rapidly shrinking, were ready to receive shipment of substantial tonnages as soon as possible. No perceptible warehouse cancellations were expected as a result of the end of the war.

MOST mills expect to catch their breaths with a period of about 48 hr of reduced operations upon announcement of final victory giving time to realign rolling schedules with the revised order board. Alloy steel producers, who already have been shipping unrated tonnages faced a more prolonged halt, because of the necessity of revising schedules at the steel making level. The long range alloy prospect is dimmer because of the great expansion in capacity brought on by the war and the drop in demand.

First inkling of a return to peacetime normalcy for the industry came with a complaint from one segment of the automotive industry that steel prices are too high. Undoubtedly this anticipates an easier supply situation and scrambling for orders in the not too distant future, with price concessions as the base.

Some sales offices detected an increase in rated civilian orders indicating that WPB was carrying out its promise of assistance for reconversion of essential industry in civilian lines. Some such orders came from the automotive industry, but it was implied that the material was for repair parts rather than for new automobiles.

DESPITE chopping off of the Navy ship program, effects of which had not yet reached the mill level early this week, there were a few crumbs for the Maritime construction industry. Barge makers reported orders on the books for which they could secure neither the material nor labor necessary for construction. Halting of ordnance plant construction likewise had failed to reflect itself in on mill order books this week.

Freight car awards during the week were heavy. Orders were placed by Santa Fe for 250 70-ton covered hopper cars with General American Transportation Corp., Baltimore and Ohio ordered 500 50-ton hoppers from Ralston Steel Car, and Detroit, Toledo and Ironton placed 200 70-ton covered hoppers with Greeneville Steel Car Co. Merchant's Dispatch Transportation Corp. will build 500 40-ton refrigerator cars and Illinois Central 300 40-ton box cars in their respective shops early in 1946. Baltimore and Ohio ordered 2000 50-ton hopper cars with 1000 going to Bethlehem, 500 to Pressed Steel Car, and 500 to Ralston. B and O orders for 350 70-ton covered hoppers have yet to be placed. Pullman Standard booked 1150 cars of various types for export to Brazil. An inquiry is pending for 800 50-ton 40 ft 6 box cars and 500 50-ton 50 ft 6 box cars.

• **STEEL PAYROLLS**—During the first six months of 1945 payrolls increased sharply over the corresponding period of 1944, according to the American Iron & Steel Institute. At the same time employment during the first half of 1945, averaging 565,700 persons per month, declined from the 576,000 persons per month averaged during the first half of 1944. The six-month total payroll of 1945 was $888,731,000 contrasted with $849,465,000 paid by the industry to its employees in the first six months of 1944. In June, wage-earning employees of steel companies earned an average of 127.2¢ per hr, which was very close to the record of 127.3¢ per hr earned last March. Nevertheless the industry's payrolls declined in June to $144,082,600 from $154,035,100 in May. Payrolls in June, 1944, totaled $140,484,400. During June an average of 561,800 employees was at work in the industry, compared with 564,600 in May. Wage earners worked an average of 45.5 hr per week in June, compared with 47.3 hr per week in May. The average hourly earning figure of 127.2¢ compared with 126.4¢ per hr in May.

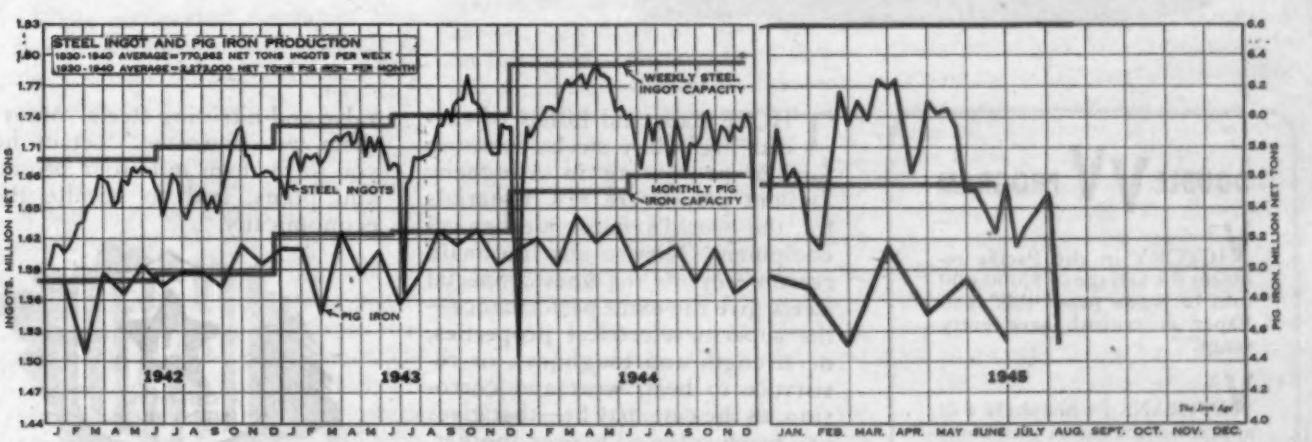
• **CORPORATION SHIPMENTS**—Finished steel products shipments by subsidiary companies of the U. S. Steel Corp. for July and the seven months ending July 31, 1945, were 1,608,994 tons. The July shipments compare with 1,602,882 net tons in June, an increase of 6112 net tons, and with 1,754,525 net tons in the corresponding month in 1944, a decrease of 145,531 net tons. Shipments for the first seven months of 1945 were 11,733,953 net tons compared with 12,387,379 net tons in the comparable period of 1944, a decrease of 653,426 net tons.

• **PEACETIME CARGO SHIP** — The first 12,600-ton peacetime cargo ship, LIPSCOMB LYKES—built under U. S. Maritime Commission contract for the Lykes Brothers Steamship Co.—was launched recently at U. S. Steel's Federal shipyard. The LIPSCOMB LYKES will be assigned to a Pacific transport job under the War Shipping Administration. Four sister ships are also under construction. All are of the Maritime Commission C-3 type design, described by Admiral Land, commission chairman as, "the best cargo ships in the world, and fast."

• **PIG IRON PRICES**—The 40¢ per ton increase in the price of by-product and retort gas coke granted by OPA on Aug. 7, is expected to reinforce applications filed with the pricing agency for increased pig iron prices. It also is held to give additional support to requests of steel producers for further price increases. As yet no additional boost has been given for beehive coke. It is doubted that action on the requests for increases in pig iron prices will be taken for six weeks or more. The increase in by-product coke ceiling prices establishes a Chicago f.o.b. level of $13 per net ton. OPA said that the increased prices were granted to compensate producers for increased coal and labor costs and was required under its overall earnings standard under which an adjustment is necessary if the earnings of the industry involved are not as great as the average for the years 1936-39.

• **REAL ESTATE ITEM**—The airconditioned aircraft engine plant here operated by Studebaker Corp. until June 1 became one of the first government-owned production facilities offered for sale or lease by Reconstruction Finance Corp. last week. The main structure is a one-story building of steel and concrete construction containing 782,988 sq ft of floor space. It occupies a site of 50 acres. RFC expects the plant to be available for civilian production within 90 days. Structures adjoining the main manufacturing plant include a power house, a chip house, an excelsior building, a styrene building, a pump house, a locker building, a storage shed and an industrial relations building with a combined floor area of 75,467 sq ft. Cost of operation of the windowless air conditioned plant has been held by some as a drawback to its speedy sale, but Paul Hoffman, president of Studebaker, once predicted that there will be "real" competition to buy the plant.

• **VETERANS RETURN**—Twenty-three thousand veterans of World War II are now at work in steel plants, more than half of whom are back on the payrolls of the company that they worked for when they went to war, according to the American Iron & Steel Institute. The number of returned servicemen now employed by the steel industry is just over 10 pct of the total of 225,000 steelworkers who joined the armed forces since passage of the Selective Service Act late in 1940. The plans for reemploying returned veterans that are in effect among steel companies included special interviewing procedures and rehabilitation methods. The great majority of steelworkers who come back to the mills prove to be both able and desirous of resuming their peacetime jobs, it is reported. An earlier survey of veteran reemployment showed that less than 2 pct came back with disabilities that required special handling. At the time of the first survey, about a year ago, around 10,000 war veterans had returned to their old companies, while 600 more had gone back to work in other steel companies.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
August 7.....	87.0*	91.0*	82.5	90.0	96.0	93.0*	90.0	94.0	100.0	77.0	94.0	87.0	85.0	88.5
August 14.....	87.0	73.0	83.0	89.0	91.0	93.0	90.0	94.0	90.5	75.5	66.0	84.0	96.0	83.5

* Revised

OWI Photo by Palmer in an Allegheny Ludlum plant

AMERICAN TREASURY... THIS YEAR'S STYLE

DOUBLE VV PROGRAM

V1 ICTORY in the Pacific requires the salvage of 8,000,000 tons of waste paper this year. Paper is critical; save every scrap!

V2 ETERANS in hospitals will appreciate the extras your community can provide with money from the sale of waste paper. Save for them!

SAVE WASTE PAPER

THOSE slabs and billets of special high-alloy steels, awaiting further processing in Allegheny Ludlum plants, are raw materials for the world's finest mechanical equipment. They're also the main reason *why* it's the finest. Special steels give the extra performance—the superior electrical properties, or strength and toughness, or resistance to heat, wear and corrosion, as the case may be—that gives one product the edge over another.

That is true for combat equipment, and it's true for commercial products. Our principal high-alloy products are corrosion and heat-resisting, tool and die, electrical, valve and nitriding steels. Many of them we originated. Let us help you to fit them into your products and plans, and to handle them economically.

Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

W&D 9338 D

Capitulation of Japanese Ends World War II

- War End Finds Nation Only Breaking Ground on Reconversion Program
- Manpower Shortage Suddenly Turns to Threat of Unemployment Problem
- Steel Orders Expected to Recoup Losses Following Immediate Slump
- WPB Holds Cancellation Telegrams Until Peace Treaty Is Signed
- Mills Plan Brief Shutdowns to Get Under Way on New Schedules
- Fourth Quarter Allocations See Drop of 99% in Military Business

Civilian Order Pattern to Shape Up Quickly After Reconversion

By TOM CAMPBELL

o o o

• • • A temporary steel order chaos caused by a sudden Jap surrender will be followed by the most competitive and active civilian steel market in the history of the industry, according to steel sales officials.

Before civilian schedules are properly analyzed and checked however, the pressure from civilian buyers who were caught without having placed tentative bookings for their postwar plans will be terrific. That a sellers market will exist for months and maybe years after order is restored seems to be a foregone conclusion.

While many steel companies have already set up alternate steel schedules involving civilian business which has been placed since the CMP was open ended the sudden peace offer found many companies in a dither as to how fast schedules can be cleared of war business and replaced by domestic orders.

The total backlog of domestic orders is large but hardly heavy enough as yet to insure economic output combined with a proper product mix. The avalanche of steel business which will come hurtling down on steel companies in the next few months will probably surpass the hectic market conditions which prevailed in 1937. At that time some companies were sold out on most products for as long as six months.

War deliveries have been quite extended in the past few years but these orders represented advanced ordering on definite plans with material coming as it was needed. The onrush of civilian business will be far more serious market wise because it will represent the attempt of all buyers to get what they think they need all at one time.

It seems apparent that old customer relationships will be quickly reestablished by steel companies as rapidly as possible. Even though a sellers market will mean mills can pick and choose, steel firms will have the eye on future sales alignments. For that reason it can be expected that steel sales officials will take a long term view when accepting orders.

Straws in the wind indicating how suddenly the onrush of civilian business will swell to large proportions is the failure of one large company to order material for a 100,000 domestic freezing unit program. It is also said that the textile machinery industry was caught before substantial steel needs were ordered.

Lurking in the background of the future record breaking order volume are questions of price and labor troubles. While there has been agitation to dispense with OPA steel price controls the government may decide to retain them for awhile.

If price controls are kept, steel mills will have to set up their schedules with the products most likely to insure profitable operations. But with the knowledge that some steel prices will go up when OPA is doomed, steel consumers will attempt to place as much forward tonnages as possible to escape any possible rise in price later. Even if OPA controls are removed quickly, the tendency to "beat the rap" will be prevalent.

Even with the danger of losing some business to other metals, high labor costs in the steel industry may force higher steel prices because of selective orders, short runs, multiplicity of sizes and grades, and an increase in small orders.

On the labor front, those close to the problem look for a substantial increase in management—labor differences. Still, labor will drive for no drop in "take home pay" when overtime hours are dropped. Much of the work stoppage will be so-called outlaw or "quickie" strikes. The prospect of sharp declines in the take home pay will be the core of the unrest according to some labor views with the labor supply easing there will be no reason to go over the 40 hour work week in the steel industry except in unusual circumstances.

The industry will face operational and commercial problems much more complex than it has faced it in the past several years, but if the record of war output of steel means anything, there is no fear but that the civilian pattern will shape up quickly after the reconversion pains have passed.

Steel Operations to Recover Rapidly Following Brief Intermission

• • • **Steel mill schedules as planned** for this week were total oblivious of war developments and it appeared that the industry would require from 48 hours to a week following V-J Day to get out of uniform and into civilian clothes.

Alloy steel production was slated for an abrupt halt with the V-J announcement because of the virtual impossibility of matching tailor made alloy specifications with possible civilian requiremtns. Carbon Steel producers on the other hand, anticipated only a slowdown period whose length would be determined by time required to pull war business from the schedules and replace them with similar civilian orders.

Order departments started the week calmly with practically no cancellations received during the period of peace negotiations. Order departments thus were afforded a breathing spell in which to formulate policy on an if and when basis. Past experience indicated a time lag of at least 48 hours from the time customers war contracts were cancelled and confirmation of steel cancellations on mill books. Although some producers were in a position to halt rolling immediately, planning to take up the slack with a plant holiday, another 48-hour period appeared necessary before schedules could assume any semblance of order compatible with a changed requirements pattern.

At least two major steel producers had ready emergency schedules calling for reduction of crews during the V-J celebration, fanning furnaces and halting virtually all rolling operations. This would allow time for realignment of rolling schedules with the revised order situation, with rolling of doubtful orders postponed until confirmation of status could be obtained.

Although scheduled ingot rates at the beginning of the week gave no inkling of revision, the revised national rate following the actual V-J impact undoubtedly will show a reduced figure. Because of interchangability of war and civilian carbon steel analyses, carbon steel producers are anxious to get melting schedules back to a near capacity basis as soon as possible in order to meet pent-up civilian backlogs. Alloy steel melting faced an almost complete halt because of the necessity of revision at the steel making rather than the rolling level.

Some steel producers seemed inclined to take matters into their own hands immediately upon the V-J announcement from Washington without waiting for customers to suspend or cancel orders. Some orders, it was felt, could be singled out for almost certain cancellation, and there was little disposition to wait on technicalities. By dropping these orders from rolling schedules and filling the holes with firm rated, and if necessary unrated, civilian orders the break in schedules could be held to a minimum. This course also could best serve customers awaiting steel to resume manufacture of civilian products. Flexibility in scheduling would allow reinsertion of any apparent war orders which were inadvertently dropped but which later were found not to have been cancelled with a delay of not more than a week. It was pointed out that most war producers have adequate steel on hand to meet immediate requirements. Orders from steel warehouses, the farm equipment, automobile and railroad car building industries seemed certain to benefit under this spot rescheduling procedure.

Although it was pointed out that under strict WPB protocol such unauthorized postponement of CMP orders in anticipation of cancellation might be taboo it was felt that WPB would take a broad view of the situation.

Other producers planned uninterrupted rolling schedules until actual cancellations were received. This presented the problem of withdrawing suspended or cancelled orders from schedules one at a time and replacing them as immediate circumstances dictated. Also present was the question of what to do with large tonnages rolled under this procedure for which shipment was held up. A major Cleveland producer secured warehouse facilities to be used until such time as termination settlement could be achieved.

Generally speaking, however, the industry was anxious to make the changeover with as little unshipped steel as possible, thus holding termination claims to a minimum. Over the long term operations probably

AIRCRAFT FURNACE: *Consolidated Vultee Aircraft Corp., San Diego, Calif., has installed this gas-heated hot air furnace, used for accelerated age-hardening of aluminum alloy aircraft parts to be controlled within ± 5° of 375° F. The oven was constructed by Industrial Oven and Equipment Co., Los Angeles. It is designed for heat-treating at temperatures ranging from 350° to 450° F. Temperature control is assisted through indirect heat transfer and constant recirculation of air.*

will be somewhat below peak levels because of necessity of making long delayed repairs.

One producer in the Pittsburgh district indicated that he would probably stop rolling on all CMP rated or validated war orders and produce steel for inventory and warehouse only. Also, of course, he would continue on such rated orders as tinplate, rails, steel for farm equipment and railroad car builders, and other such critical domestic uses.

Companies are sitting tight awaiting cancellations. As of Monday afternoon, they had been relatively light but it is expected that all mill schedules will be completely wiped out and new schedules started from scratch.

Backlogs were still running high just before the end. One company reported about 8,000,000 tons in backlogs, of which 1,000,000 tons or a month's production was in unvalidated orders. The 7,000,000 ton rated backlog will probably be cut to 2,000,000 tons or even less by the V-J Day proclamation. July saw a heavy influx of unvalidated orders on company books, especially in sheets. In fact, most companies indicate that sheets comprise more than 50 pct of the unvalidated tonnages on their books.

With the heavy flood of cancellations will also come another greater flood of new orders for civilian items. It is felt here that WPB will continue to control the flow of steel, despite the V-J Day announcement, so as to channel materials into those industries that are the most critical from an essential civilian standpoint. Also, it is feared in some places that larger companies will hog the entire steel output for some time and not permit the smaller manufacturers to get steel and get reconversion underway. Thus, WPB control, it is felt by some, is desirious after victory for regulation of what will be scarce materials for some time.

Rust Designs New Furnaces For Tie Plates, Splice Bars

Pittsburgh

• • • New types of tie plate and splice bar furnaces, described by the company as making substantial production improvements, particularly in tie plates, have been designed under contract from United Engineering & Foundry Co., by Rust Furnace Co., Pittsburgh.

The tie plate furnaces are fully continuous, giving more than twice the capacity per furnace of the orthodox, partly continuous types, and effecting more thorough and even heating than previously possible, according to Rust officials.

The splice far furnaces, also continuous, have the new feature of being end-discharged, as well as end-charged, saving on handling equipment, labor, and also increasing production capacity per furnace.

Two furnaces of each type have been designed and materials furnished for erection by United Engineering & Foundry Co. in Russia.

Merger Denied by Union

Chicago

• • • Turning down a merger recommendation of the National Executive Board of the Congress of Industrial Organization, members of the United Farm Equipment Metal Workers Union, CIO, voted Sunday by 29,086 to 2250 against amalgamation with the United Auto Workers, CIO.

The Farm Equipment Workers claim a membership of approximately 70,000.

Wildcat Strike Halts Operations at Inland; Reject WLB-Union Plan

Chicago

• • • Steel making operations at Inland Steel Co.'s East Chicago, Ind., plant were halted by strike Friday following discipline imposed upon an electrical worker, a union officer, for taking an unauthorized vacation. Although the company reported a threat to withdraw maintenance crews, halting of steel operations was orderly and all open hearth heats were tapped.

Strikers rejected demands by the War Labor Board and by officers of the United Steel Workers CIO that they return to work. The company maintained coke production but blew out two of its own and one DPC blast furnace Monday night.

Six of nine plants of American Steel Foundries were idle early this week after 5000 workers struck on Friday in a dispute over negotiating a new contract. It was held possible that the other plants would join in the strike this week.

"KOVAR" HEAT: ***A special alloy used as a connecting link between metallic materials and glass in electronic tubes and other electrical devices is being poured from this small electric furnace in a Westinghouse plant. The alloy is composed of cobalt, nickel, and iron.***

War Agencies Only Partly Prepared for Sudden Advent of Victory

Washington

• • • With most war agencies only partially prepared or faced with the almost insuperable task of revising reconversion plans, the WPB's master plan awaited only Japanese signatures on the peace agreement. Meanwhile Congress will be called into session Sept. 4 to complete reconversion legislation.

Included in this total is an estimated $1,200,000,000 as the result of the Navy's stopping work on 95 ships which were under construction. In addition to the work stoppage on the larger vessels, construction of 160 district craft and smaller auxiliaries, which had been scheduled but not started, will not begin.

The vessels on which work was stopped are one battleship, two carriers, 10 heavy cruisers, 10 light cruisers, 11 destroyers, 6 submarines and 39 auxiliaries. It was roughly estimated that total army and navy cancellations and cutbacks would aggregate between $25,000,000,000 and $30,000,000,000.

Immediate relaxation of controls will see the discontinuance of CMP which is reportedly to be written off the books on Sept. 30 instead of Dec. 31 as originally planned. The immediate discontinuance of all fourth quarter allotments has already been ordered and over-all estimate of individual agencies requirements are in for a complete overhauling.

Exact details of the plan that WPB will put into the breach are a matter for disclosure at an early date but they are expected to work in with the previously announced "transition" priority system set up under Priorities regulation No. 29.

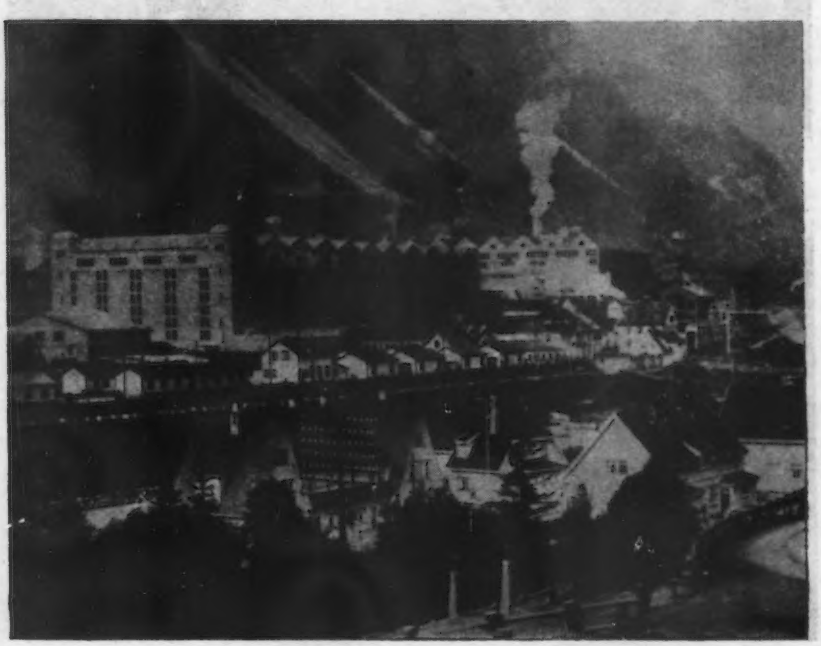
It is expected that the priority pattern will provide for reconversion assistance along the lines requested by the President in his letter to WPB chairman J. A. Krug. While affording top priority to decreased military demands, necessary civilian and foreign requirements, ample protection will be afforded those key reconversion industries whose early resumption of production is so necessary if the impact on our economy is to be minimized. Wide latitudes will be given other manufacturers to secure needed materials on the open market which is expected to see ample quantities available once the wholesale military cancellations reach suppliers and minor distribution kinks are worked out.

Vigilant efforts to enforce inventory restrictions will be continued. The practical minimum working inventory rule is expected to be strengthened by specific inventory limitations such as the 60 and 45-day pattern now in effect.

Price control faces the sternest test. With the bulk of OPA's pricing procedure based on continuing war production, manufacturers who find their financial position jeopardized by stringent ceilings will undoubtedly seek relief as never before and put a greatly increased burden on the OPA staff. Formulas devised heretofore allow for small increases in prices of items that were either complete or partial war casualties but that procedure may not afford the needed relief. OPA's authority expires on July 1, 1946. The Act of course could be repealed by Congress. However, price control over steel and other basic products undoubtedly will be continued for some time

The WLB's expected announcement permitting individual wage increases was withheld in view of expected developments which will necessitate a thorough revamping of wage policies. Wage control authority expires six months after the end of the war unless Congress extends this WLB act.

NITRATE PLANT: *According to the Norwegian Information Service, the Germans planned to make atomic bombs in this nitrate plant at Rjukan. Plans were thwarted when the Norwegian underground blew up the factory, the Service said.*



National Radiator Announcing Veterans' Employment Program

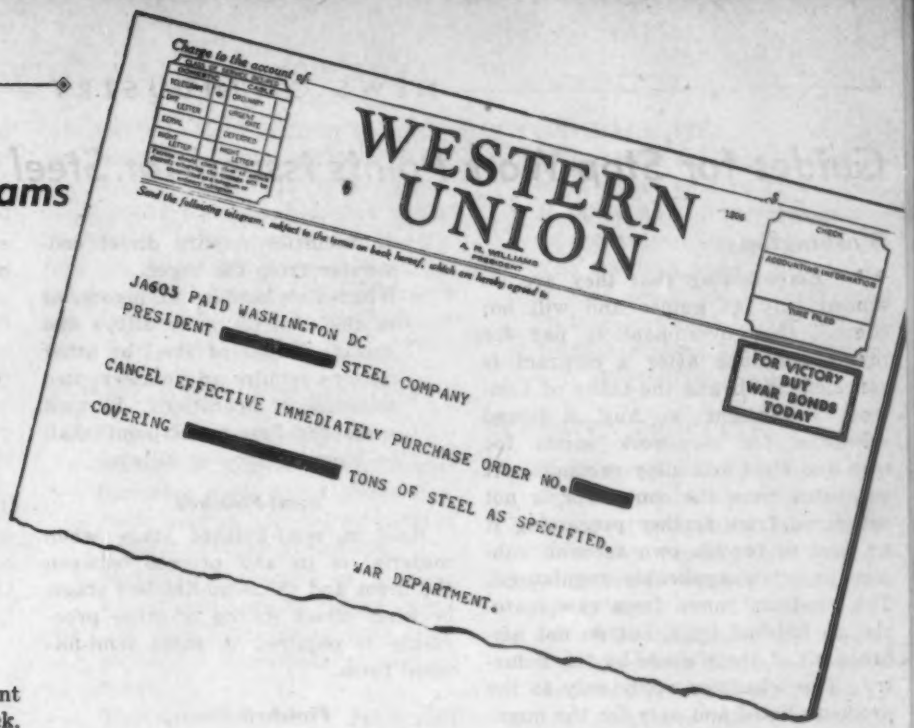
Johnstown, Pa.

• • • A comprehensive reemployment program for veterans of World War II has been established by the National Radiator Co., E. W. Longacre, vice-president in charge of manufacturing, announced. The plan has been devised, he explained, to provide maximum incentive to return to the organization of those who left permanent and temporary positions to enter the armed forces, and also to be of maximum interest to World War II veterans having no previous employment record with the Johnstown firm.

A scientific analysis of each job classification within the national organization is being made. A personnel engineering firm has completed its survey at the company's general offices, one plant in New Castle and one in Johnstown, and is making rapid steps toward the completion of this analysis throughout the various other national plants.

Under the supervision of Glenn Ledebur, industrial relations counsellor at National Radiator, a counseling service for the veterans to aid in their re-orientation and rehabilitation has been established.

Cancellation Telegrams Awaited Only Release Order From War Agencies



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Washington

• • • Just as soon as it was evident that the Japs were about to crack, the Army and Navy Departments, long ready with what is called the "Book Plan" for V-J Day, alerted their procurement services to be ready to file thousands of previously prepared cancellation and cutback telegrams with Western Union and Postal. Involving multi-billions, these dispatches carried the song of peace and the greatest slashes in the world's history of orders placed with industry. They foretold the transition from swords to plowshares.

The messages, coded by contract numbers, were held by the telegraph companies awaiting flash release orders from the two departments instantly upon formal announcement of the end of the war. So numerous as to load the wires to their utmost, the telegrams directed prime contractors to cancel or cut back orders. Prime contractors in turn were to order similar action by their subcontractors and the latter also in turn were to immediately cancel their subcontracts thus completing the chain of cancellations and cutbacks.

Contracts completely cancelled, such as those for munitions no longer needed, were called zero items. The other category, providing for cutbacks, affected such contracts as those for clothing, food and other supplies for the armed forces, contracts whose continuation is necessary.

While the great bulk of war items was scheduled for cancellation, there were some which were not even curtailed. However, they represented only a small percentage of total contracts and covered units or portions of units on which development is continued, of which rockets are an example.

The cancellation and cutback programs, effected on a much less extensive scale on V-E Day than on V-J Day, was centered around Section 202 of the War Mobilization and Reconversion Act. This section provides that "Any contracting agency shall terminate prime contracts for war production whenever in the opinion of the agency the performance under such contracts will not be needed for the prosecution of the war, and shall not continue performance under such contracts merely for the purpose of providing business and employment, or for any purposes other than the prosecution of the war, unless the Office of War Mobilization and Reconversion finds that the continuation of some or all of the work in process under any such contract will benefit the government or is necessary to avoid substantial physical injury to a plant or property."

Emphasizing the government's major responsibility to assist in the achievement of an orderly transition from war to a peacetime economy based on unprecedented civilian production, President Truman on Aug. 9 requested Chairman J. A. Krug to continue a five point program designed to speed up the reconversion process.

This program which will continue only until Dec. 31 in the absence of Congressional action extending the War Powers Act beyond that date, puts the WPB in position as the number one operating reconversion agency. Although further specific plans are expected to be forthcoming, the plan as outlined is believed to be adequate for the present at least. The Administration is reported to have definite ideas for a reconversion agency even beyond that date, should the need still exist. "Every opportunity must be given to private business to exercise its ingenuity and forcefulness," the President said, "although it is necessary for the WPB to continue, for the present, some of the effective measures it has adopted to achieve our unprecedented war production. These controls, however, should be lifted as soon as they are no longer needed."

The program which the WPB will carry out in a manner consistent with the policies laid down by the Congress in the War Mobilization and Reconversion Act is as follows:

1. A vigorous drive to expand production of materials which are in short supply, not only because of military demands, but to meet civilian demands as well.

2. Limitation upon the manufacture of products for which materials cannot yet be made available, so as to avoid excessive pressure on supply which would threaten our stabilization program.

3. A broad and effective control of inventories so as to avoid speculative hoarding and an unbalanced distribution which would curtail total production and endanger our stabilization program.

4. Granting priority assistance to break bottlenecks which may impede the reconversion process.

5. Allocation of scarce materials necessary for the production of low priced items essential to the continued success of the stabilization program.

Guides for Stop-Work Points Issued for Steel and Other Materials

Washington

• • • **Emphasizing that they are intended only as guides and will not commit the government to pay for processing done after a contract is canceled, WPB and the Office of Contract Settlement on Aug. 8 issued schedules for stop-work points for iron and steel and alloy products. At the same time the contractor is not restricted from further processing if he does so for his own account, subject to other applicable regulations. The products range from raw material to finished lines, but do not embrace all of those made by the industry. The schedules apply only to the products listed and only for the quantities on which the producer intends to file a claim because of termination.**

Based on recommendations by WPB's Industry Divisions to the OCS, one of the chief uses of the schedules is a pattern for a pre-termination agreement in which the contractor and the procurement officer decide in advance of cancellation how best to wind up a contract. It was pointed out that this will enable the manufacturer to plan ahead and cut down the time and plant disruption involved in changing from one kind of production to another.

The schedules are designed to show the stages to which fabrication or processing can best be carried on when cancellations are received.

In proposing the stop-work schedules, the industry divisions have followed the policy laid down by the War Dept. that calls for the immediate halting of work upon notification of the contract's termination except where it is considered that additional processing is required for reasons of safety, to prevent damage to production equipment or to avoid spoilage of work in process that may have commercial value. In such instances the schedules provide for carrying out processing to the first practical stop-work stage.

The schedules follow:

IRON AND STEEL PRODUCTION:

Raw Material

Hold in raw material form when material has not been charged in furnace or melted.

Ingots

Hold in ingot form when material has been charged in furnace or is in the process of being melted or poured, except—

a. When manufacturing processes or facilities require direct conversion from the ingot.

b. When slow cooling of ingots, as in the case of many alloys and special grades of steel or other reasons require an uninterrupted sequence of operations. In such cases the first break-point shall be blooms, slabs or billets.

Semi-Finished

Hold in semi-finished stage when material is in any process between the ingot and the semi-finished stage, or when direct rolling or other processing is required to some semi-finished form.

Finished Form

Hold in finished form when material is in process from semi-finished material or when direct converson necessitates finishing the material. By finished form is meant finished rolled or other processed form. It does not include such further processing as punching, drilling, cutting to special lengths, turning, grinding, special testing or packaging. Operations such as straightening would, however, be permitted, as well as packaging when it is required for the proper storage of a completely finished product.

Ferrous Castings

a. If materials have not been charged in cupola or melting furnace, hold in raw material form.

b. If materials have been charged or are in the process of being melted the heat may be cast.

c. If castings are in any stage of furnace treatment, such stage may be completed.

d. If castings are in any subsequent stage of cleaning, grinding, rough machining not beyond normal foundry practice, etc., the stage then in process may be completed.

In the production of any iron and steel product covered by this schedule when material is in process from one form to another it may be carried to completion of the form then in process, but no further.

FORGINGS: Open Hammer, Drop Hammer, Fast Action Press (Maxi Press) and Upsetter.

a. Hold in raw material form (ingots, billets, blooms, slabs, bars, etc.) when material has not been placed in the forge heating furnace.

b. If material has been sheared, sawed, cracked, etc., to length, no further operations should be performed.

c. If material has been charged in the forge heating furnace or is in the process of being heated for any stage of forging, the forging to be performed from such heating may be completed.

d. If the forging has been completed and is in any subsequent stage such as trimming, rattling, heat treating, rough machining not beyond standard forge shop practice, etc., the stage then in process may be completed.

e. If material is on hand for the manufacture of dies, but the dies have not been sunk, hold in raw material form. If the dies are in process of being sized, sunk, heat treated, etc., only the stage in process may be completed.

In the production of any forgings or dies covered by this schedule, when material is in process from one form to another, it may be carried to completion of the form then in process, but no further.

LARGE PRESSED FORGINGS

a. *Hot Ingot Process:* If the metal-

WELDING POSITIONER: *One of several welding positioners is being used with a radial drill press to accommodate work that cannot be handled by the universal tables furnished by machine tool builders. In this setup a turbine cylinder half is drilled, tapped, and spot faced on both ends, both sides, the top, and at an angle for oil drain holes in a single setup.*

lurgy and specifications of the finished product require the steel to be maintained at temperature from tapped ingot to finished forging, then,

(1) Complete the forging cycle;
(2) If the forging has been completed and is in the stage of heat treating, complete the heat treating;
(3) If the forging is in the process of being machined, stop the operation where is and as is.

b. *Cold Ingot Process:* If the metallurgy and specifications of the finished product permit the practice of allowing ingots to cool to room temperature prior to reheating for forging, then,

(1) Hold in raw material form ingots, billets, blooms, slabs, etc., when material has not been placed in the forge heating furnace;
(2) If material has been sheared, sawed, cracked, etc., to length, no further operations should be performed;
(3 If material has been charged in the forge heating furnace or is in the process of being heated for any stage of forging, the forging to be performed from such heating may be completed;
(4) If the forging has been completed and is in the stage of heat treating, complete the heat treating;
(5) If the forging is in the process of being machined, stop the operation where is and as is.

NICKEL, MONEL, AND INCONEL MILL PRODUCTS

Raw Material

Hold in raw material form when material has not been charged in furnace or melted.

Ingots

Hold in ingot form when material has been charged in furnace or is in process of being melted or poured.

Semi-Finishing Operations

Complete the immediate operation which the material is then undergoing such as overhauling, hot working, pickling or heating. Hold in semi-finished form immediately following such operation.

Finished Forms

Complete immediate operation which material is undergoing. Such operations might be hot rolling, annealing, pickling, overhauling, cold drawing or cold rolling. Hold in form of condition resultant from completion of such operation without further processing, with the exception that if the processing being performed is the final operation such as re-squaring of sheets or final drawing of cold drawn rod, the material is to be finished and packed to avoid damage.

RAILROAD TRACK MATERIALS

Frogs, Switches and Turnouts

a. Materials in inventory at manufacturing plant and materials en route may be held for disposition without further processing.
b. Materials in course of fabrication should have no further work put upon them other than completion of immediate processing stage.
c. Materials completely fabricated but unassembled may be held in inventory unassembled.

Rail Anchors

a. Material in bar form, including special rolled shapes, and blanks sheared to size may not be further processed.
b. Formed anchors not heat treated may remain untreated; if in furnace, the treatment should be completed.

INCAPACITATED VETERANS: *A special effort is being made by the Caterpillar Tractor Co. to utilize the services of partially disabled veterans of the war. At work in their Peoria plant, these men have been assigned to jobs where their incapacity does not affect their jobs.*

COTTON BALE TIES

a. If material has been rolled to billet form, hold in billet form.
b. If billet form is in furnace for subsequent rolling, roll into strip coils and hold in coil form.
c. If coils are in straightening and cutting machine, hold in cut lengths without further fabrication or bundling.

TUNGSTEN PRODUCTS

a. Hold in raw material form if further processing has not begun.
b. If initial processing has started, hold the products as purified tungstic oxide or ammonium para tungstate.
c. If alkali treatment has begun, reduce to tungsten metal powder and hold in this form.
d. If ingots have been produced or if material is in course of sintering, hold in ingot form.
e. If ingot is being swaged into rod, hold in rod form.
f. If rod is being converted into wire, hold in rod form or in wire form at end of immediate die operation.
g. If wire or rod is being fabricated into leads for seals, coils, filaments, grids and supports, finish operation.
h. If ingots are being rolled into sheets, hold in semi-finished form without further processing.
i. If sheets are being fabricated, do not clean or anneal beyond immediate operation.

MOLYBDENUM PRODUCTS

a. Hold in raw material form if further processing has not begun.
b. If initial processing has started, hold the products as purified ammonium molybdate.
c. If ingots have been produced or if material is in course of sintering, hold in ingot form.
d. If ingot is being swaged into rod, hold in rod form.
e. If rod is being converted into wire, hold in rod form or in wire form at end of immediate die operation.
f. If wire or rod is being fabricated into leads for seals, coils, filaments, grids and supports, finish operation.
g. If ingots are being rolled into sheet, hold in semi-finished form without further processing.
h. If sheets are being fabricated, do not clean or anneal beyond immediate operation.

ODT Getting Most of Needed Materials Under Final CMP Allocations

Washington

• • • ODT announced on Aug. 11 that the greater part of the carbon steel requirements for transportation equipment it asked for the fourth quarter under CMP has been allotted by WPB. Total allocations of carbon steel for transportation equipment were 1,470,485 short tons, as compared with stated requirements of 1,648,623 tons or 89 pct.

All ODT material programs for the fourth quarter of 1945 were met by WPB allotments except for new replacement rail and track accessories, and property-carrying highway transport equipment. H. H. Kelly, director ODT Division of Materials and Equipment called attention to the fact that this is expected to be the final allotment under CMP which is scheduled to terminate as of Dec. 31. This is the eleventh quarterly allotment of controlled materials, the first having been for the second quarter of 1943.

Total stated steel requirements by ODT during the life of the plan, including maintenance, repair and operating supplies, have amounted to approximately 21,000,000 tons, the largest by any non-military agency. Of this total over 17,000,000 tons have been allotted to ODT for United States domestic transportation equipment and supplies.

Carbon steel allotments for the fourth quarter of 1945 for the more important transportation items are as follows:

1. Replacement rail—as in the past, ODT asked for full capacity of rolling mills for controlled cool rail or 600,000 tons, and also 288,000 tons for track accessories. In view of other essential requirements including frogs and switches, industrial rail and military needs, WPB could assign only 518,000 tons for rail and 249,000 for track accessories. Requirements of rapid transit lines for 11,000 tons of rail and 3000 tons of track accessories were met in full.

2. Railway rolling stock—All requirements were met in full as follows: Locomotives 41,500 tons, freight cars 240,000, passenger train cars 6100, railway marine equipment 3000 tons. To complete allotments made in the third quarter 3635 tons of steel were allotted for troop sleepers and kitchen cars.

3. Highway transport—For passenger-carrying equipment all requirements were met as follows: (in tons of carbon steel) integral buses 13,000, street cars 950, bus bodies 6000, trolley coaches 300. For property-carrying equipment, including trucks, trailers, bodies and third axles the ODT made a demand for 248,700 tons. The WPB made a conservative allotment of 191,562 tons but indicated that supplementary allotments would be made later if required to meet the approved production program. Full requirements of 155,000 tons of carbon steel were met for automotive replacement parts.

4. Water transport—Requirements of 28,000 tons allotted.

5. Petroleum and other liquid transport—Requirement of 438 tons allotted to tank trailers.

6. Allotments for alloy steel, copper and aluminum were in accord with the carbon steel base allotment for all programs.

Production of the programmed 1200 troop sleepers and 400 troop kitchen cars for which most of the needed materials were authorized in the third quarter, will be under way in September and is scheduled to be completed by the end of the year.

OIL RESERVES: *Navy Seabees assemble a drill rig to aid in uncovering oil reserves in Northern Alaska, which might be available in case of a National emergency in petroleum.*

More Steel Division Promotions

Washington

• • • Additional appointments and promotions made necessary by recent resignations (IRON AGE, July 19, page 103) were announced by WPB Steel Division Director William B. Todd on Aug. 7. These included: R. F. Sentner to be deputy director, A. A. Archibald to be assistant production director and chairman of the production directive committee, M. B. McCafferty to be deputy assistant director for production, C. R. Grabeel to be secretary of the production directive committee, G. L. Anderson to be deputy chief of the carbon bar branch, and M. M. Chapman to be deputy chief of the sheet and strip branch.

Ford Tractor Production Shifted to Highland Park

Detroit

• • • Manufacture of Ford-Ferguson tractors has been transferred from the Rouge plant to the Highland Park plant of the Ford Motor Co. Offices of Harry Ferguson, Inc., co-producer of the tractor, have also been shifted from the Rouge, where tractor production and administration has been centered since mid-1939.

Removal of all the required machinery is said to have cost more than $1,750,000.

Organized Labor Must Aid In Transition To Postwar Peace Economy

Pittsburgh

• • • With the close of the Japanese phase of the war, American organized labor proceeds into a revolutionary stage. The fighting and bickering between management and labor, and occasional head cracking will probably disappear as organized labor enters maturity. This changeover is not going to be a development that occurs overnight, but it will be speedy since the status of unions and organized labor has been established and recognized. It is now no longer a question of "will organization of labor succeed?" Labor has come of age and is now recognized universally as a vital and necessary part of the economy of this country.

However, labor's first job during the period of reconversion from war production to peacetime output is to aid that development. Neither industry nor labor can afford to be intolerant during this period, because if either or both are intolerant, the chances are that government controls will increase rather than decrease. Further, intolerance by either side will be against the interests of the country as a whole, and public opinion will swing great weight against the offender.

As pointed out recently in a radio broadcast by Secretary of Labor Lewis B. Schwellenbach, labor has made excellent gains during the past 12 years, and, while it is not wished that labor lose a single step of its advance, labor must recognize more than ever that with the establishment of its rights, "It must assume in even greater measure its responsibility for the common good."

Labor has a difficult transition to make. Unemployment because of the end of the war is without question. Some sources estimate that within a matter of weeks, nearly 8,000,000 will be unemployed, but on a longer range prediction, the War Manpower Commission figures this total will drop sharply. WMC estimates that by June, 1946, unemployment will drop to something less than 2,000,000, but this same prediction is based on a very large military force of over 10,000,000.

The immediate effect of the end of the war on labor, however, is very important. War contractors will have to make large-scale layoffs for periods varying from days to weeks for reconversion. By tapering off war production, this can be avoided to a large extent, but it will mean only that production of useless war materials that will move directly into surplus stocks will continue. On the other hand, complete and immediate cancellation of war contracts will cause unemployment, but will reduce the total expenditures for the war considerably. Politicians may suffer if the latter course is chosen, because voting constituents will not favor the layoffs, and it may be depended upon that some action toward a smoother transition period will be attempted by Congress. Just how successful that will be remains to be seen.

Another problem facing this country in so far as labor is concerned is the wage question, both as to hourly rates and guaranteed annual incomes for wage earners. Reduction of work weeks from 48 to 40 hours will bring to a head the demands of organized labor for increases in hourly rates so as to make the total take-home earnings of labor equal to those during peak war periods. Further, a concentrated drive for the guaranteed annual wage for factory workers will be accentuated. Disregarding the hazards of benefits of such union efforts, the important thing is that both business and labor must get together and settle the matter amicably rather than through radio broadcasts, newspaper releases, and propaganda which tell how the other side is holding back and interfering with negotiations. This has been too common a practice in the past, and these practices should be abandoned for direct, honest and peaceful negotiations between the parties concerned.

Keen interest has been aroused by the labor trend in the recent British elections. High-sounding phrases have explained the aims of the present British Government, which include nationalization of industry, increased social services, promotion of foreign trade, and the enactment of much legislation that is termed "social." However, it must be remembered that the first job of the British government is to increase Britain's wealth and producing ability. There is little comparison between the British labor movement and that in the United States. In the first place, despite splendid wartime achievements, practically all of British productive capacity is antiquated, and, as has been pointed out by Sydney Gruson of the *New York Times*, restrictive trade union practices, poor business management and extensive war damages hamper quick and smooth readjustment of Britain to a peace-time economy.

The opposite is true in this country. Production equipment is the best in the world, business management is of high calber, and, despite many arguments to the contrary, past labor legislation offers a solid foundation for social progress rather than social revolution.

Before Britain's social program can succeed, there must take place an industrial revolution, that will bring its industry up to high standards, so that the money necessary to pay for such a social program is forthcoming. Here, industry earnings are comparatively high, labor's earnings are the highest ever, and the national income is sufficient to warrant greater strides toward a higher standard of living than ever before.

GUIDED MISSILE: ***Much research among fighter plane manufacturers in this country is directed toward the development of guided missiles to replace the Thunderbolts and Lightnings of World War II. This German type is radio controlled, travels at about 600 mph, attacked Allied aircraft.***

Canning of Ordnance Required Half Million Tons of Steel, Aluminum

Washington

By EUGENE J. HARDY

o o o

• • • Faced with the task of storing in usable condition enormous quantities of ordnance material for use in the war against Japan as well as for long term storage, the Ordnance Department has instituted a method of preserving many types of equipment in cans, which will require 500,000 tons of steel and aluminum sheet and plate for the initial part of the program. Since this work is currently in the development stage and the need for long term storage is not immediate, Ordnance does not contemplate using priorities for any large quantities of sheet steel at present.

Because of the quantities of material involved it was soon deemed impractical to store equipment in the usual manner. That is, disassembly of the equipment and then coating it with cosmoline, a heavy grease. Material so coated is stored in warehouses, and every year or year and one half is overhauled, regreased and restored. Under present conditions this method would be costly in the extreme. The cost for a major piece of artillery ranges from $1,000 to $5,000. Today the Ordnance Department has 750,000 pieces of artillery as against 9,000 at the start of the war. Warehouse storage of the vast wartime Ordnance production would necessitate increasing present storage space of 20,000,000 sq ft to more than 300,000,000 sq ft. The canning of fighting equipment solves that problem, since most canned material will be stored in the open.

It had also been suggested that dehumidified warehouses be used for storage, or that war material be stored in the dry western states. Neither method would suffice. Special construction would be necessary to provide the dehumidified warehouse, and the cost would be prohibitively high. As for the western deserts, it has been established that no part of this country maintains a relative humidity at the safe level to prevent corrosion of under 30 pct.

Experience in storing, in relatively dry western areas, Ordnance equipment in which breathing and condensation occur has shown that corrosion there is as bad as, or worse than, in other parts of the country.

After exhaustive research in cooperation with industry canning was decided upon as the most practical method for permanent storage.

There are three methods of packaging in use at present. One is a short term method, easy to apply but effective for only three to five years. The other two methods are for permanent storage and will preserve the contents indefinitely.

For short term storage the equipment is sprayed with a plastic which coats it with a nonpermeable film. This film may be easily stripped off when the equipment is needed. Since the film is relatively easy to apply in the field, weapons can be given temporary protection until such time as it is desired to protect them permanently.

The two long term methods of storage use either steel or aluminum containers. Steel being used runs from 3/16 to ⅜ in. in thickness. The steel containers are sealed hermetically after the equipment has been placed inside. The air is exhausted and an inert gas such as nitrogen is pumped in at a positive pressure of about 5 lb. Braces and frames are used to hold the equipment rigid.

Sealed by this method weapons can be dropped over the side of a ship and floated ashore and left on the beach until it is convenient to move them. While the weapon will not corrode or deteriorate, the container is subject to corrosion. Research on different finishes promises to solve this problem. Nitrogen is used as the inert gas since it is used in artillery recuperators and hydro-pneumatic recoil systems. All gun batteries are supplied with it, and furthermore, it is readily available from the air in any part of the world.

In the steel cans neither moisture nor oxygen is present; therefore, there is no corrosion or deterioration. A simple gage tells at a glance the nitrogen pressure. Placing the can on skids keeps it from contacting the ground and lessens the opportunities for corrosion.

Sixteen gage sheets will be used for the aluminum containers. Since it is impracticable to make an aluminum container that is airtight, the container is allowed to breathe through a ventilator containing a desiccant, which balances the pressure and dehumidifies all air entering the can. This packaging method requires the changing of the drying agent but it has the advantage that aluminum will not corrode, except under certain conditions, as constant exposure to salt water. A gage on the container tells when moisture is present in the can.

In size and weight, the cans vary from small drums of 50 gal size suit-

able for fire control instruments, such as telescopes, and electric equipment, weighing 50 to 100 lb complete, on the one hand, up to huge cans almost 20 ft long, 8 ft wide, and 10 ft high for 90 mm guns weighing 12 to 15 tons.

To open the can, it is only necessary to use a huge "can opener," remove one end and the weapon can come out ready for combat in a few hours. Some of the cans permit the wheels to remain in place on the gun carriage outside the can during transportation, so that they are actually dehumidified warehouses on wheels. When a location of permanent storage nature is reached, the wheels can be removed and preserved inside the container.

Ordnance will "can" only those units which do not become obsolete quickly. Artillery weapons and their auxiliary fire control instruments, directors. and the like provide the best example, for this war's use of huge numbers of World War guns indicate their long-term usefulness. Newer combat items, such as current tank types, which are outmoded by improved models, are being studied for possible canning; but already approved for this treatment are rifles, carbines, bazookas, the new recoilless rifles shooting artillery shells, and mortars, as well as the already mentioned artillery weapons. Nothing that is generally obtainable from industry, motor vehicles, for example, will be canned. Storage of ammunition has not been considered under this program.

The costs involved in canning are a vital consideration. Study of the problem has proven that this method is actually the cheapest way of preserving ordnance material for long periods, such as 25 to 50 years. Figures now available indicate that the cost runs to about 5 pct of the value of the material. Only the small additional charges for periodic painting and for supervising open storage will then be entailed for the next 25 to 50 years. In ordinary storage, there is the cost of overhaul every one to one and one half years, each overhaul costing up to 10 pct of the value of the material.

A 90 mm gun on carriage M1A1 costs about $40,000 and a 40 mm gun with director costs about $17,000. If the traditional method of storage were used at a cost of $1,000 to $5,000 per overhaul, these weapons would cost more in overhaul than their value in 25 years. By canning, it is actually possible to preserve for 50 years a newly overhauled gun for less than the cost of overhaul.

SHEET CONTAINERS: *Containers for artillery mechanisms for storage will use over* **500,000** *tons of aluminum and steel sheet. Aluminum containers include a special breather unit.*

By using this method for long term storage, artillery and other valuable ordnance items can be strategically deployed in any part of the world, rather than confined to localized warehouses, ready for almost instant use should the peace of the world again be disturbed. As Ordnance officials point out, if these weapons are not needed to preserve peace before they become obsolescent they will still provide a substantial reservoir of scrap metal. Should it be necessary to use the weapons again the containers would also provide a considerable quantity of scrap.

At the present time development work on the steel containers is being done at the Ambridge plant of the American Bridge Co. Glenn L. Martin is working on the aluminum containers.

The following government agencies and contractors have also contributed to this program: U. S. Navy, Forest Product Laboratory, Bureau of Standards, U. S. Weather Bureau, Coordinating Research Council, Johns Hopkins University, Society of Automotive Engineers, Davison Chemical Co., International Harvester Co., and the Cargocaire Engineering Corp.

U.S. Ranked Fifth In Prewar Steel Exports Among Other Nations

New York

• • • **The end of the European phase** of the war has brought much speculation as to the probable volume of world trade for iron and steel products in the postwar years ahead. There are many reasons to believe that in the immediate years of reconstruction the export of steel from the United States will far exceed that of the prewar years.

Although during World War II the United States became the leading exporter of iron and steel in the world, in the years before the war this country was outranked by several European nations.

In 1936, a representative prewar year, the United States supplied only 8 pct of the international trade in steel plant products, despite the fact that then, as now, it operated virtually half of the world's steel capacity.

World trade in steel plant products that year totaled nearly 16,600,000 tons of pig iron and rolled steel, of which less than 1,400,000 tons were shipped from this nation.

That total put this country in fifth place among nations, ranking behind Germany with nearly 4,000,000 tons; Belgium-Luxembourg, 3,300,000 tons; the United Kingdom, 2,300,000 tons; and France, 1,700,000 tons. The nations of Europe were by far the biggest importers of iron and steel and at the same time the largest exporters.

Almost half (8,200,000 tons) of the iron and steel going into world trade in that year went into European countries, including the United Kingdom and Soviet Russia. Nearly 85 pct of all the steel exported from one country to another came from Europe.

All told, during 1936, nearly 7,800,000 tons of pig iron and rolled steel products were shipped between European countries—this intra-European movement of products accounting for nearly 47 pct of the total world trade in steel plant products that year.

Allen Syndicate Rushing Formal Geneva Bid After Corporation Withdrawal

New York

• • • Plans for the submission of a formal bid for the lease of the Geneva steel mill by Colorado Fuel and Iron Co. are now being completed, and legal work involved is under way, according to Jacob L. Holtzman, director of CF&I and counsel for Charles Allen, Jr., who recently acquired controlling interest in the Colorado firm.

The Allen group is playing its cards close to its chest in regard to possible cooperation with Henry Kaiser in a venture involving the Utah plant. It is indicated, however, that the investment syndicate formed by Allen is not interested in combining forces with Kaiser to the extent of acquiring an interest financially in Fontana, on any terms.

Interest, however, in the effect that Kaiser's name might have on the prospects of the venture, and in his reputation for productive genius, is evident in any conversation with Mr. Holtzman. The Wall St. counsel, who is also a member of the board of Allen-controlled Wickwire-Spencer Steel, feels that the announced withdrawal of the Steel Corp. from the Geneva race will have little effect on the outcome of the race. He explains his views by saying that political pressure from Washington never gave the Corporation a chance to acquire the mill.

Plans for the expansion of the CF&I property are awaiting the outcome of the proposed merger of the Wickwire-Spencer firm with CF&I which is expected to go to the stockholders of the two firms some time in September. Mr. Allen's group owns enongh of the CF&I stock that approval from that quarter is assured, but a wide stock distribution at Wickwire leaves some question as to the outcome there. According to Mr. Allen, however, there is little doubt that the Wickwire stockholders will approve the plan.

Charles Allen, Jr.

He told THE IRON AGE this week, however, that his plans for the expansion both in tonnages and productwise planned for CF&I will go forward regardless of the outcome of the merger or the negotiations for Geneva.

Mr. Allen's history in Wall St. dates back to the time that he was still under 21 yr old when he founded Allen & Company, a partnership, in which he is the senior partner. He made a name for himself in the thirties dealing in "penny stocks," notable among which was United-Whelan Cigar Co., and at this time he made his first fortune. He is now 41.

According to Mr. Holtzman, Mr. Allen is in the steel business to stay, although he may after a period of time change his mind, take his profit, and leave the steel business.

AMERICAN IRON AND STEEL INSTITUTE

Production of Open Hearth, Bessemer and Electric Steel Ingots and Steel for Castings

YEAR 1945

Based on Reports by Companies which in 1944 made 97.9% of the Open Hearth, 100% of the Bessemer and 86.7% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
January	6,468,815	90.5	379,062	76.0	358,346	77.3	7,206,223	88.8	1,626,687	4.43
February	5,967,842	92.4	347,227	77.1	339,520	81.1	6,654,589	90.8	1,663,647	4.00
March	6,927,377	96.9	398,351	79.8	382,237	82.4	7,707,965	95.0	1,739,947	4.43
1st Quarter	*19,364,034*	*93.3*	*1,124,640*	*77.6*	*1,080,103*	*80.2*	*21,568,777*	*91.6*	*1,677,199*	*12.86*
April	6,541,097	94.4	372,952	77.2	377,877	84.1	7,291,926	92.8	1,699,750	4.29
May	6,663,577*	93.2	402,100	80.6	386,075*	83.3*	7,451,752*	91.8	1,682,111*	4.43
*June	6,129,266	88.5	379,807	78.6	333,217	74.2	6,842,290	87.1	1,594,939	4.29
* *2nd Quarter*	*19,333,940*	*92.1*	*1,154,859*	*78.8*	*1,097,169*	*80.6*	*21,585,968*	*90.6*	*1,659,183*	*13.01*
* *1st 6 Months*	*38,697,974*	*92.7*	*2,279,499*	*78.2*	*2,177,272*	*80.4*	*43,154,745*	*91.1*	*1,668,139*	*25.87*
†July	6,330,052	88.7	381,857	76.7	287,716	62.2	6,999,625	86.5	1,583,626	4.42
August										4.43
September										
Quarter										

YEAR 1944

Based on Reports by Companies which in 1944 made 97.9% of the Open Hearth, 100% of the Bessemer and 86.7% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
January	6,770,423	97.2	439,551	85.4	382,629	84.4	7,592,603	95.7	1,713,906	4.43
February	6,410,914	98.5	409,781	85.2	373,314	88.1	7,194,009	97.0	1,737,683	4.14
March	6,977,466	100.1	455,368	88.5	393,423	86.8	7,826,257	98.6	1,766,649	4.43
1st Quarter	*20,158,803*	*98.6*	*1,304,700*	*86.4*	*1,149,366*	*86.4*	*22,612,869*	*97.1*	*1,739,451*	*13.00*
April	6,789,422	100.6	437,472	87.8	366,794	83.5	7,593,688	98.8	1,770,090	4.29
May	6,879,253	98.7	437,444	85.0	385,879	85.1	7,702,576	97.1	1,738,730	4.43
June	6,463,049	95.8	419,699	84.2	351,509	80.1	7,234,257	94.1	1,686,307	4.29
2nd Quarter	*20,131,724*	*98.4*	*1,294,615*	*85.6*	*1,104,182*	*82.9*	*22,530,521*	*96.7*	*1,731,785*	*13.01*
1st 6 months	*40,290,527*	*98.5*	*2,599,315*	*86.0*	*2,253,548*	*84.7*	*45,143,390*	*96.9*	*1,735,617*	*26.01*
July	6,743,812	96.6	415,543	80.9	339,032	74.6	7,498,387	94.3	1,696,468	4.42
August	6,715,835	95.9	429,672	83.5	353,406	77.6	7,498,913	94.1	1,692,757	4.43
September	6,501,944	96.1	398,058	80.1	335,109	76.2	7,235,111	94.0	1,690,446	4.28
3rd Quarter	*19,961,591*	*96.2*	*1,243,273*	*81.5*	*1,027,547*	*76.2*	*22,232,411*	*94.1*	*1,693,253*	*13.13*
9 months	*60,252,118*	*97.7*	*3,842,588*	*84.5*	*3,281,095*	*81.8*	*67,375,801*	*96.0*	*1,721,405*	*39.14*
October	6,860,921	98.0	420,105	81.6	339,859	74.7	7,620,885	95.6	1,720,290	4.43
November	6,572,454	97.0	403,908	81.0	302,357	68.6	7,278,719	94.3	1,696,671	4.29
December	6,678,460	95.6	373,322	72.7	314,388	69.2	7,366,170	92.6	1,666,554	4.42
4th Quarter	*20,111,835*	*96.9*	*1,197,335*	*78.4*	*956,604*	*70.8*	*22,265,774*	*94.2*	*1,694,503*	*13.14*
2nd 6 months	*40,073,426*	*96.3*	*2,440,608*	*80.0*	*1,984,151*	*73.5*	*44,498,185*	*94.2*	*1,693,878*	*26.27*
Total	80,363,953	97.5	5,039,923	83.0	4,237,699	79.0	89,641,575	95.5	1,714,644	52.28

Note—The percentages of capacity operated are calculated on weekly capacities of 1,372,755 net tons open hearth, 116,152 net tons Bessemer and 102,350 net tons electric ingots and steel for castings, total 1,791,257 net tons; based on annual capacities as of Jan. 1, 1944 as follows: Open hearth 82,233,610 net tons, Bessemer 6,074,900 net tons, Electric 5,320,880 net tons. Beginning July 1, 1944, the percentages of capacity operated are calculated on weekly capacities of 1,380,647 net tons open hearth, 116,152 net tons Bessemer and 102,757 net tons electric ingots and steel for castings, total 1,799,981 net tons; based on annual capacities as follows: Open hearth 82,604,400 net tons, Bessemer 6,074,900 net tons, Electric 5,372,130 net tons.

Graphite Bronze Sales Down

• • • Cleveland Graphile Bronze Co. reports net sales for the first half of 1945 of $30,852,169 and estimated net profit equal to $2.30 a common share. The estimated profit is after provision for federal taxes, estimated reserves for contingencies and for renegotiation, and dividend requirements on 5 pct preferred stock.

In the corresponding half of 1944, when sales amounted to $30,995,527, the profit was originally estimated at $2.92 a common share, but was subsequently reduced to $2.54 a share by an increase of the renegotiation reserves.

Steel Cut May Be 95 Pct in Quarter

Washington

• • • V-J Day will see a precipitate drop in military requirements for steel. In the final analysis, it is expected that less than 5 pct of previously estimated quarter allotments of 4,300,000 tons will be needed by the services. This is based on the fact that continuing demands can be readily met from inventories.

Export needs of nearly 2,000,000 tons may not be met in their entirety but after all quantities of steel which may be earmarked for specific uses are accounted for, around 12,500,000 tons should be available for industrial uses.

Fourth quarter requirements for the non-military uses were to have been around 8,500,000 tons.

WPB to Revoke All L and M Orders

Washington

• • • With the exception of a few conservation orders relating to tin, rubber and possibly textiles, WPB will reportedly revoke all L and M orders. There will not necessarily be wholesale revocations, it is said, inasmuch as ordinary procedures will be adhered to wherever possible. The administrative functions at WPB are expected to taper off before Dec. 31.

The steel division, however, is expected to continue in existence at least through the fourth quarter in order that bottleneck assistance may be given wherever needed.

Construction Speeded By Order Amendment

Washington

• • • Recognizing the need for completing industrial and other types of construction authorized without general priorities assistance, WPB announced Aug. 13 that expediting aid and priorities assistance would be given to get material needed to break construction bottlenecks.

"This action," WPB Chairman Krug said, "is aimed at speeding up industrial construction to provide additional manufacturing facilities. Emphasis is being placed on industrial expansion that will give employment to workers as fast as they are released from war production."

Pointing out that over-all priorities assistance will not be given construction projects authorized under the new amendment to Direction 5 of Construction Order L-41, Mr. Krug stated that "we are nearing the time when the full green light will be given." Projects that may be authorized without general priorities are:

1. Projects that will provide additional manufacturing facilities.
2. Those involving public transportation, health and safety, or religious and educational activities that do not quite meet the criteria for facilities for essential civilian services.
3. Those for which materials, equipment and other resources required are on hand or are kinds that are readily available without priorities assistance.

Application for supplementary priorities assistance for projects initially authorized without priorities is made by letter to the office where the original construction application was filed. Under the construction order priorities assistance for materials is extended to builders of the following three categories of construction:

1. Additions to or alterations of existing facilities for making civilian goods.
2. Facilities for production of certain bottlenecks materials or components holding up other aspects of production, war or civilian.
3. Facilities needed for essential civilian production.

Hillman Announces Nationwide Campaign

New York

• • • Sidney Hillman, national chairman of the CIO Political Action Committee, has announced to representatives of key international unions in CIO that PAC will launch a nationwide campaign to force Congressional action on pending reconversion legislation. Between now and Sept. 4, when Congress reconvenes, CIO committees will call on their members of Congress to inform them of labor's needs.

One of the most important objectives of the campaign was the expansion and liberalization of unemployment benefits, he said, along the lines suggested by the President, $25 weekly for six months. Others were the Murray - Patman Full Employment Bill, the 65c per hr minimum wage, the Wagner-Murray-Dingell social security bill, a national housing program, and additional veterans' legislation.

For additional information on the impact of the end of the war on American labor, see story on page 104E.

AUSTRALIAN MACHINE SHOP: *Works of Broken Hill Pty. Co., Ltd. B. H. P. include complete finishing mills and some finished steel product facilities.*

Manpower and Unemployment Reverse Positions as Major Problems at War End

Pittsburgh

• • • As has been pointed out many times before, the steel industry as such will not have a very big job to reconvert to peacetime production. Its war production, in the main, has been products that are similar to those it has always manufactured. However, there is one phase in this reconversion that may cause trouble and that is the time element. Mills cannot immediately on the announcement of V-J Day start rolling civilian unvalidated orders. The rated orders must of needs be cleared from the mill schedules either by cancellation or completion.

This will take a few days and it is likely that steel operations in the industry and specifically Pittsburgh will drop during that week. There is a tremendous amount of paper work facing the industry and full crews will be needed for this while actual production crews may be laid off.

The local War Manpower Commission director this week said that Pittsburgh district war plants are scheduled to lay off from 34,000 to 35,000, workers within 90 days after V-J Day. And the War Manpower Commission is preparing now to lift employment controls. Manpower referrals and priority systems as well as employment ceilings will be eliminated immediately after victory has been confirmed.

Manpower officials estimate that a large percentage of those laid off will be women who go back into homes and others will be salesmen, waiters, barbers and other such workers who will return to their old jobs. The layoffs will occur mainly in plants employed in the production of direct war materials such as shells, rockets, bombs and their components.

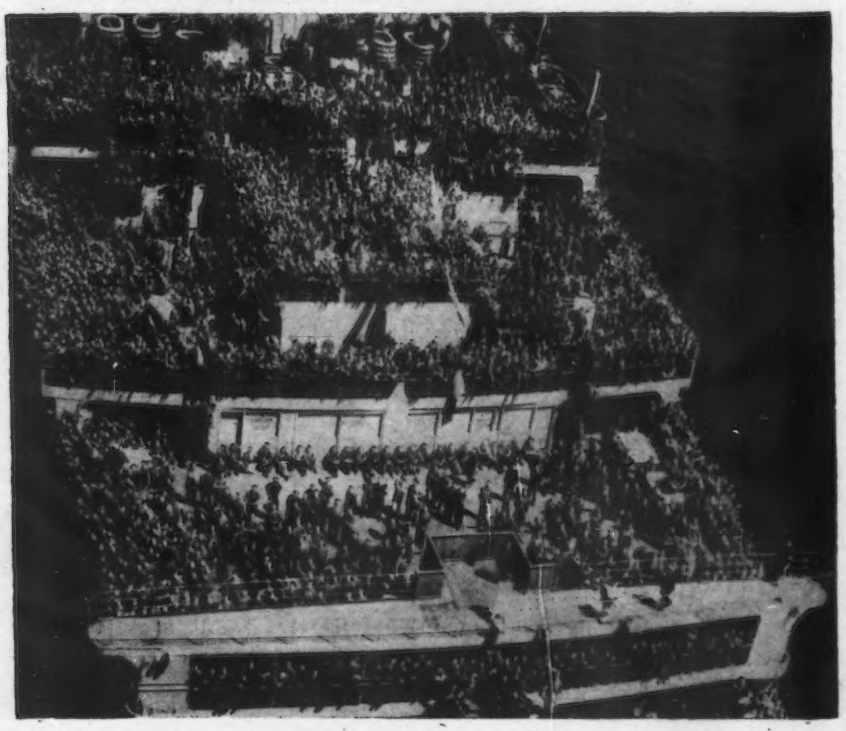
There will probably be little time lost in Pittsburgh's reconversion because it is mainly a materials center, producing steel, coal and aluminum. The reconversion of the electrical industry in Pittsburgh may take a little longer, but plans have progressed to the point of actual installation of such equipment as may be needed for civilian production.

Because there has been no appreciable population shift in the Chicago area, reconversion should be achieved in this district with a minimum of unemployment. Normally about one-third of Chicago's labor force is employed in manufacturing and 23 pct in trade, as compared to Detroit where 47 per cent are employed in manufacturing.

Hardest hit will be war-born aviation and aircraft engine plants, such as Dodge Chicago and Douglas, which are expected to make mass layoffs. Studebaker and Buick already have felt the ax and their worker force has been largely absorbed elsewhere. It is estimated that more than 1500 firms in the area are associated with the aviation industry either directly or indirectly.

Turning of the manpower worm was signified when about 450 employees of the Oaks Products Division of Houdaille-Hershey Corp., North Chicago, paraded in protest yesterday against the plant's closing for two weeks to change from war to civilian production.

EUROPEAN VETERANS: *American and Canadian troops jam the decks of the* Queen Mary *as she steams up New York Harbor at the end of her voyage from Europe. Troops numbered about* 15,000.



CIO-UAW to Oppose Policy on Unemployment Compensation

Detroit

• • • Active opposition has been promised by the CIO United Automobile Workers Union against the Michigan Unemployment Compensation Commission policy in cutting workers off compensation when they refuse low pay jobs.

Commission policy has always been that when a worker refuses to accept a job available to him which he is qualified to do, he is removed from the compensation rolls. The number of men whose weekly checks have thus been cut off is said to have enlarged notably in recent months as the number of war jobs diminishes, leaving open only posts which pay in lower brackets.

Charges made by the auto union that the commission was "forcing labor to set lower wage scales," were denied. Eugene Dormer, commission director, said that wage scales on all jobs offered by his body were set by the WLB.

RFC Asking Purchase Offers

Washington

• • • RFC is asking for offers to purchase or lease a Massillon, Ohio, plant which is being operated by the Canton Drop Forging & Mfg. Co. The plant has nine 3 to 20-ton cranes which were installed in 1912 and reconditioned in 1944.

Ordnance Cutbacks Take Shape; Construction Activity Ordered Halted

New York

• • • **The early pattern of cutbacks** in the ordnance district offices took shape as officers ordered the cessation of construction activity, and stop orders waited for the green light. Estimates of the size of the cuts varied, but reliable sources indicated that 95 pct would be a fair figure.

In Columbus, Ohio, Sunday, Col. Charles L. Hall, U. S. Division Engineer, ordered all construction of ordnance plants in the Ohio River Division—totaling $60,000,000—to be halted immediately.

Among projects suspended is the $55,000,000 rocket powder plant at Charlestown, Ind., known as the Indiana Ordnance Plant. Smaller jobs include a $1,325,000 expansion program at the Buckeye Ordnance plant at Ironton, Ohio, and a $1,145,000 expansion at the Firestone rim plant at Cambridge, Ohio. Without waiting for a formal end to the war, Col. Hall instructed all officers in the Ohio River Division to get word to the thousands of workers on these jobs not to report Aug. 13. Eighteen thousand workers affected at Charlestown alone. Thus Col. Hall prepared to wind up war building jobs on which his office has spent nearly $1,250,000,000 since 1941.

Telegrams ready to go out from Cleveland Ordnance District will bring to dead stop at least 95 pct of the war work over which that district has control. Word of contract cancellations will reach manufacturers within few hours after official victory proclamation. Hundreds of termination notices that are ready will affect all phases of ordnance production—tank and automotive, ammunition, artillery and small arms. A few contracts, primarily those supplying replacement parts, will weather the avalanche.

Cancellation of approximately 2250 active contracts with 650 companies, affecting $800 million scheduled future production was slated by the Chicago Ordnance District to become effective on VJ-Day.

The district estimated that from three to five months would be required to achieve termination settlement of the bulk. On July 31 the district held for termination settlement 460 cases involving $850 million, only 20 of which were over three months old.

The break from war production appeared less severe than had it come earlier for ordnance production in the district has dropped from a March peak of $164 million to $96 million in July. The district comprises Northern Illinois, Northern Indiana, Wisconsin, Iowa, Minnesota, North and South Dakota and Northern Michigan, but about half of its output comes from the Chicago area.

Although the Chicago area thus far has had fewer war contract cutbacks than any other area, the impact of the war's ending is expected to be felt less here than elsewhere. Manufacture of components, changed little for war or civilian use, comprises a large segment of local war output, and such essential industries as farm equipment, railroad, railroad equipment will enjoy stepping up of present activity. Likewise the shackled automotive parts, appliances, radio industries are anxious to get into mass civilian production.

WPB to Spot Check Cancelled Ratings

Washington

• • • **WPB Chairman J. A. Krug** on Aug. 14 told industry that WPB regulations governing inventories would be enforced both before and after V-J Day.

With the Japanese War likely to end at any moment, the WPB chairman, assigned by President Truman to the task of pushing reconversion and its attendant reemployment, took immediate steps to see that wide-scale civilian production is not impeded by excessive stockpiling, pre-emptive buying or hoarding of scarce materials by a few.

Mr. Krug instructed James Folger, vice-chairman in charge of field operations, to notify his field offices all over the country to be prepared to make spot checks of war factory inventories, in order to make certain that cancellations of war contracts were promptly followed by cancellations and unrating of their own orders. Appropriate instructions have been sent to all WPB regional and district offices by telegram.

Woodlock Now Vice President Of Rochester Ropes; Quits RFC

Washington

• • • **Joseph Woodlock** has resigned as executive director of the RFC office of surplus property to accept a position as executive vice-president of Rochester Ropes, Inc., Jamaica, N. Y., and Culpepper, Va. Mr. Woodlock, however, will remain with RFC as consultant until October on loan by Rochester Ropes, Inc.

STRIKE AT JAP STEEL PLANTS: *U. S. Third Fleet carrier-based planes on a recent raid drop incendiary bombs on the Kato Special Steel Mfg. Co.'s plant at Fujisawa, near Tokyo.*

Scrap Prices May Delay Postwar Developments in Openhearth Practice

Pittsburgh

• • • **Stabilization** of the price relationship between scrap and production of pig iron was recommended recently by F. W. Sundblad in a paper presented before the Assn. of Iron and Steel Engineers. Mr. Sundblad, who is assistant openhearth superintendent of Great Lakes Steel Corp., Detroit, stated that unless such a relationship is established mechanical improvement in openhearth practices, especially charging practices will be held up.

He pointed out that there were many economic difficulties involved in the development of openhearth charging systems, because such developments tend to favor high scrap charge percentages and low scrap prices, while the efficiency of the systems themselves would create greater demands for scrap and consequently boost prices. This, of course, would in turn automatically lower the competitive strength of the new systems as compared with the older methods.

The rise of the big scrap producing automotive and container industries in the past 25 years plus the decline of the older major industries consuming finished steel in the forms of rails, pipes, structural shapes, and other heavier products affected the potential scrap supply. Formerly, leaving as finished products, it took 20 to 40 years for the metal to come back as scrap. However, now there is immediate scrap from fabricating plants which totals about 10 pct of the semi-finished steel shipped, and the life of the finished product has been shortened to one to 20 years. Scrap comes from four main sources: That produced in the mill, scrap produced in finishings processes outside the mill; short-cycle scrap such as automotive; and long-cycle scrap such as rails, pipe, and structural.

Ed. note: The paper written by Mr. Sundblad will appear in full in the August issue of "The Iron and Steel Engineer."

The yield of scrap in the past decade was about 38 to 40 million gross tons a year. Deducting 15.5 million tons produced in the mills, the available supply is 22 to 24 million tons. In 1936, a typical year, steel producers purchased only 12,319,386 tons, leaving a surplus of over 10 million gross tons. Exports were necessary and much was lost in dumping grounds of every city.

Consequently, with such facts staring the steel industry in the face, the economic as well as the technical aspects of the situation must be considered in the development of steel making facilities.

Mr. Sundblad pointed out that the problem is being considered by some from a different angle. Because of the dwindling of high grade ore deposits there must be brought about a relationship between the price of scrap and the costs of pig iron which is sound enough and stable enough to induce promotion of greater mass production techniques in charging and melting periods, thus altering the economic and technical aspects of the scrap problem to meet modern standards. In other words, the profit motive must be subordinated to the production motive to such an extent as to totally eliminate speculative influences upon the rise and fall of the scrap price. From the technical standpoint, the scrap yard must become a modern processing plant handling collection and preparation on the basis of scientific surveys and mass machine technique.

CLOTHES DRYER: *The exact temperature in the spinning metal basket that holds the clothes in this postwar Westinghouse dryer is measured by Miss Ann Baker, engineering aide at the Mansfield, Ohio plant. This unit is an adjunct to the home laundry unit introduced by the same company just before Pearl Harbor.*

The war has helped to bring such a condition about. United States is becoming constantly more scrap conscious. National scientific surveys are being used to determine the supply and demand of scrap, and these surveys constitute the basis for scrap collection and distribution.

Whether this trend, according to Mr. Sundblad, is to be extended into the postwar period depends upon the success of present efforts to work out a definite plan to serve as a guide for postwar decisions pertaining to the future relationship between the steel and scrap industries versus the scrap situation created by the war. He pointed out that the postwar scrap problem centers on three basic fundamentals: (1) World finished steel production, between 80 and 100 million tons a year since 1939, constitutes potential scrap. The biggest percentage of this tonnage, together with the tonnage in wrecked buildings, bridges, and railroads, will be in Europe and Asia. (2) A major percentage of this belongs to the United States government: (3) Preparation, segregation, transportation on American boats offer practical means of reversing lend-lease commitments, so that the price of this scrap in American ports would amount only to the cost of freight plus the price fixed by the United States.

Imports of scrap will govern the price of domestic scrap, and for this reason, the price-fixing policy of the government covering foreign scrap must be made in the light of this relationship as well as in the light of the production costs of pig iron. The price must be low enough to be within the proper range of the costs of pig iron and high enough to cover the base price plus the costs of collection, processing, loading, and transportation, plus the profit regarding domestic prices. Mr. Sundblad stated this can be accomplished on one hand by the regulation of the base price, not by the government, but by the scrap industry in conjunction with the government, according to policies dealing with the movement of scrap, and on the other hand by the fact that this setup would totally eliminate speculation in scrap. These potentialities, then, would make possible a stable and sound scrap price relative to the costs of pig iron, which means an entirely new basis for the openhearth process. On such a foundation, the development of the mechanical phase in openhearth practice would be destined to enter a new era of progress.

German Design Improvisation Described by Timken Metallurgist

Canton, Ohio

• • • "Metallurgically, Germany showed us nothing!" said Martin Fleischmann, metallurgist of the Timken Roller Bearing Co., Steel and Tube Division, after a four month examination of German steel and ordnance production for the Army ordnance through the Combined Intelligence Operational Subcommittee. "However, from the standpoint of design, the Germans were absolutely uncanny."

The shortage of alloying elements in Germany forced Nazi industry to achieve by design alone many of the things that the Allied nations were accomplishing by the use of alloys. A typical example was in the construction of turbine blades and combustion chambers for jet aircraft engines. Because nickel and chromium was extremely short in Germany, these parts were made of steels of low physical properties. However, the turbine blades were hollow and cooled by blasts of air forced into the hollow blade. The combustion chamber and jets of the engine were made of ordinary low carbon sheet steel that had been chromized, aluminized, or coated with an aluminum lacquer to prevent corrosion.

In his four month tour of German industrial facilities, Fleischmann visited among other places, the Krupp Steel plant and several others in the Ruhr district including the Bochumer-Verien steel plant, the Deutsche-Edelstahl Works, and the Mannesmann Tube Works. The Krupp visit was extremely profitable to the CIOS representatives in that it yielded 17 tons of highly secretive patents and detailed drawings on some of the most advanced ordnance equipment in the world. Fleischmann stated that it would take a good sized crew of engineers at least a year to go through the data found and catalogue it for Allied use.

Because of the shortage of alloying elements, Germany's steel industry during the past five years developed many low-alloy, emergency steels. Practically all steels used in ground transportation equipment was standard carbon steels, and this was true also to a large extent in the case of aircraft. Tool and die steels were, mainly, standard compositions. Vanadium, recovered from slag, was used extensively as an alloy, despite its extremely high cost of recovery. One point of interest was the research done by German metallurgists in the use of nitrogen as a former of austenite in steels in place of critically short nickel.

Standard high alloys developed by the Germans for their jet aircraft, of which they had considerable, were: Tinadure, which contained about 0.10 pct C, 30 pct Ni, 15 pct Cr, and 1.8 pct Ti; Chrondure, which contained about 0.5 pct C, 18 pct Mn, 12 pct Cr, 1 pct Va, and 0.20 pct Ni; and Berlaloy, which contained 17 pct Cr, 15 pct Ni, 2 pct Mo, and 1.15 pct combined Ta and Co. However, these were not available for large production, in the last couple of years of the war.

Heavy presses in Germany also interested Fleischmann. He stated that he found a 15,000 ton press at Frankfort that was being used to form propeller blades, in one stroke, and was informed that a 30,000 ton press had been built and put into operation near Berlin for forging large aluminum aircraft parts, such as wing spars. At the Mannesmann Tube Works, a horizontal extrusion press was discovered that was being used to extrude composite steel and copper tubing. The product had an outside wall of steel and an inside wall of copper.

The use of ceramics in gas turbines and as cutting tools also aroused considerable interest among the members of the Combined Intelligence Operational Subcommittee. Sintered alumina and chrome oxide were used extensively for cutting tools for fast finishing cuts on hard steels and for machining non-ferrous metals. Also, a sintered ceramic and metal composition had been employed for the fabrication of turbine blades for gas turbines. Advances by the Germans have been great in the development of centrifugal castings, especially for the production of gun tubes, and continuous casting had been widely employed in the production of large diameter aluminum and brass ingots.

Speaking of the destruction of the steel industry by combined British and American bombings during the war, Fleischmann stated that just about 20 pct of German industry was completely knocked out. While the Krupp works at Essen was supposed to have been badly hit, the plant superintendent stated that in three months he could have the plant back to about 30 pct of capacity production. Buildings were badly damaged, Fleischmann stated, but actually the machinery and equipment was fairly intact under the wreckage of the buildings. Krupp's coke plants and power facilities were hardly touched, and the steel making furnaces were not too badly damaged.

Research is well developed in Germany and the facilities are far superior to anything in this country, Fleischmann claimed. The bulk of the industrial research facilities had been moved into the south of Germany high up in the mountains and it was virtually untouched by the war. It is his opinion that United States would do well to put American supervision in these research laboratories and put them to work for us. He believes that the personnel of the laboratories will willingly work under American direction, and it would be far better for the United States to supervise these activities in Germany than to try to move the facilities to this country.

Information from other sources also indicates that the Germans are willing to work for us, possibly with the thought in mind that otherwise they will be tilling the soil of the fatherland, whether they be physicist or metallurgist.

DEPPELER HONORED: *The Miller Award of the American Welding Society has been awarded to J. H. Deppeler, chief engineer of the Metal and Thermit Corp., New York for outstanding contributions to the art of welding. Established in 1927 by S. W. Miller, the award is an annual one. Mr. Deppeler has been connected with the company since 1912 in various capacities.*

WPB Narrows Sheet and Strip Inventory Limits

Washington

• • • According to an announcement on Aug. 10 the 45-day limitation on users inventories of sheet and strip steel has been narrowed to apply only to carbon steel sheet and strip and to silicon electrical sheet and strip.

This was accomplished by amending Direction 24 to CMP Regulation 2 to exclude all alloy sheet and strip steel, including stainless steel except silicon electrical, from the inventory limitations of the direction.

As a result, WPB said, it will be unnecessary for users of alloy sheet and strip steel including stainless steel, other than silicon electrical to adjust their outstanding orders, as previously required by the inventory limitations of Direction 24. The direction now confines the 45-day inventory restriction to the extremely tight items of carbon and silicon electrical sheet and strip steel, as there has been an improvement in the situation of the other alloy sheet and strip items including stainless steel. The amended direction also excludes from its restrictions persons using sheet and strip steel in ship repair or conversion yards for ship repair.

However, in the above cases, the provisions of Paragraph B of CMP Regulation 2 (specifying a 60-day inventory or a minimum practicable working inventory, whichever is less) still apply, WPB pointed out.

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Export Premiums Approved

Washington

• • • OPA announced on Aug. 13 that effective Aug. 18 exporters of relaying rails and used track accessories may use the same export premiums that were established previously for exporters of other iron and steel products. This action applies to warehousemen who perform certain processing operations, such as straightening the rails, and to dealers who sell material that has not been put through any warehouse processes.

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Metal Furniture Controls Partially Relaxed by WPB

Washington

• • • A second step in the relaxation of production controls on the metal furniture and fixture industry was announced on Aug. 11 by WPB. Manufacturers now may use steel in making furniture and fixtures to the extent of 25 pct annually (6½ pct a quarter) of the amount they used for those purposes in the base production year, July 1, 1940-June 30, 1941, by an amendment to L-13-B. Production within the 6¼ pct a quarter ceiling does not require authorization nor labor clearance by WPB, nor will such production carry priorities assistance. WPB stated in the amendment that it cannot assure manufacturers they will be able to get the materials needed for production up to the ceiling established in the order.

A ceiling of 50,000 tons of carbon steel has been set upon the total usage of steel by this industry in each of the third and fourth quarters of 1945, including all authorizations under priorities regulation 25.

In view of the current shortage of sheet steel, WPB explained, certain industries with a very large potential use of this metal are being placed under ceilings that will limit their consumption of free market steel and keep them from possibly preempting a disproportionate supply of freed materials at the expense of other types of production. The progressive raising of these ceilings is contemplated by WPB as resources are freed by military cutbacks. In the base year, July, 1940-June, 1941, the metal furniture and fixture industry used about 800,000 tons of steel.

Producers desiring to use steel in excess of the individual 6¼ pct limitation or the $50,000 a quarter exemption, or to substitute steel parts for wooden ones in excess of the permitted dollar value, must apply for authorization under PR-25.

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REDS IN MANCHURIA: *V-J Day finds the Red Army occupying important sections of the rich mineral North China province of Manchuria.*

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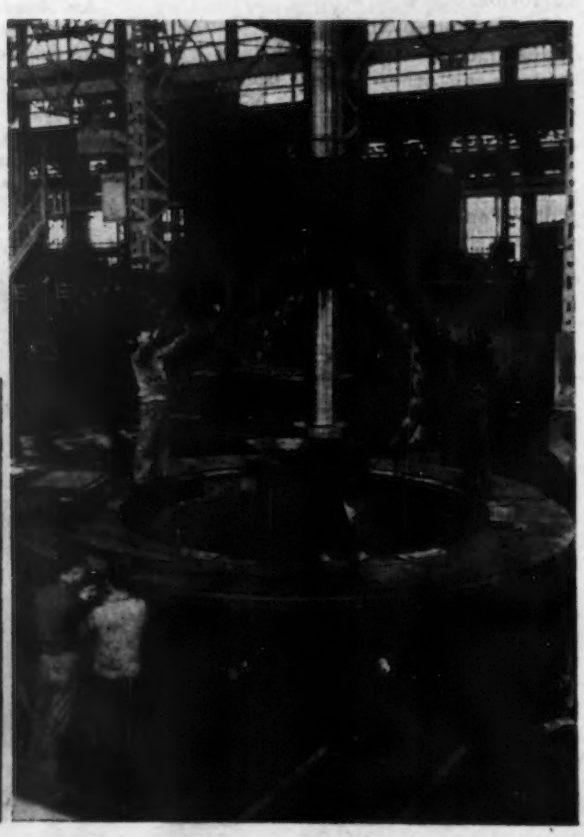


Carnegie-Illinois Survey Shows Service Men Have New Skills

Pittsburgh

• • • That 89 pct of Carnegie-Illinois Steel Corp. servicemen intend to return to the company is indicated by first returns of questionnaires recently mailed to employees of this U. S. Steel subsidiary now in the armed forces.

Forty-four thousand of these questionnaires were mailed, and the first 1000 have just been tabulated showing that 894 plan to return to the company, 80 are undecided and of the 26 men who do not intend to return, 20 plan to take advantage of the government's offer of schooling. Further returns, of course, may change these percentages.

Information obtained from the questionnaires will be useful in estimating the number and abilities of the thousands of men who will return to operations in the Pittsburgh and Chicago district plants and offices.

To determine what new skills the servicemen have acquired they were requested to list these skills and offer suggestions as to their significance in re-employment. Nearly one-half, 49 pct, have listed skills obtained while in service. Of the skills mentioned, they judged 55 pct to be of value to the steel industry. Two-thirds of the skills developed were in production or maintenance lines, one-fourth in technical or staff work, and one-tenth in supervisory capacities.

Among other extensive preparations for the return of servicemen is a recent survey made in the plants of U. S. Steel to determine the types of jobs on which injured veterans may be safely and productively employed. In its final form it shows that many of the thousands of jobs surveyed can be performed by men returning with handicaps arising from their service in the armed forces.

With the questionnaire Carnegie-Illinois sent a booklet to each serviceman, giving in detail the company's policies on reinstatement. It contained a letter from J. L. Perry, president, which says, in part:

"We look forward to the day when there will be a place for you as one of our employees who will re-enlist in the business of making steel for peace-time use."

Industrial Briefs . . .

• PLASTIC PLANT—The Goodyear Tire & Rubber Co. has announced plans to build a vinyl-plastic plant in Buffalo for the manufacture of a group of plastics derived from lime and coke. Construction is scheduled to start about August 15 and completion is expected in approximately six months.

• SURPLUS DISPOSAL—The Elmwood Ave. plant in Buffalo of the Bell Aircraft Corp. has been leased by the Reconstruction Finance Corp. as a center for the disposal of surplus war materials.

• SALES ENGINEER—Fred Hoelzel, Detroit industrial engineer, has been appointed product and sales engineer of the Hupp Motor Car Corp., of Cleveland and Detroit.

• BUYS PUMP FIRM—Oil Well Supply Co., Los Angeles, U. S. Steel Corp. subsidiary, has announced its intention of exercising an option for purchase of the assets of Neilsen Pump Co. of Calif.

• SALES BRANCH — Fruehauf Trailer Co., Detroit, will begin immediately to build a new sales and service branch on a 5-acre tract of land recently acquired in north Kansas City, Mo. It will be the second largest of Fruehauf's 60 branches in the country. Completion is scheduled by November.

• SHOE PROTECTION MANUAL—Designed to assist plant safety directors in dealing with foot protection, a 64-page manual has been issued by the Hy-Test Div. of International Shoe Co., St. Louis. Topics range from scientific discussion of foot hazards to stock selection and sales method.

• ACQUIRES TOOL CO.—Wheel Trueing Tool Co., Detroit, has announced the purchase of the Adamant Tool Co., of Bloomfield, N. J.

• NEW WAREHOUSE — To help meet the increasing needs for prompt service on tool, alloy and stainless steels, the Carpenter Steel Co., Reading, Pa., has announced the opening of a new warehouse and office located at 790 Greenwich St., New York, under the supervision of R. P. Evans.

• NEW DIVISION — The formation of a new division, Bendix International, to handle the comprehensive foreign trade program of Bendix Aviation Corp., has been announced.

• EXPANDING — An $11,500,000 expansion program to permit overall production 50 pct greater than prewar of existing types of electric appliances and manufacture of new postwar products by the Mansfield, Ohio and East Springfield, Mass., Electric Appliance Div. plants of the Westinghouse Electric Corp., was recently announced.

• FOUNDRY ENGINEERING SPECIALISTS—Lester B. Knight & Associates has formed a consulting and engineering service specializing in foundry problems with headquarters at 120 South La Salle St., Chicago.

• BUYS PLANT—L. G. S. Spring Clutch Corp., a wholly owned subsidiary of Curtiss-Wright Corp., has embarked on an expansion program which included purchase of the three-story Mars Hill plant in Indianapolis operated at present by the Allison Div. of General Motors.

• REPRESENTING — Thomas C. Barber, formerly chief tool engineer of the Dodge-Chicago Engine Plant, has opened offices in Chicago for the exclusive sales and engineering representation of the Buhr Machine Tool Co., The Kelly Reamer Co., Carbide Fabricators Co., and Morse Tool Co.

Electronic Gaging Device at Timken Developed for Blind

Canton, Ohio

• • • **A friendly hand,** reaching out into the dark to offer financial independence to thousands of America's blind has been extended by the Timken Roller Bearing Co. in the form of a new electronic sound gaging device.

Given its first public demonstration last week in Timken's Canton bearing factory before a small audience composed of high-ranking leaders of the blind, of industry, the American Legion and officers of the company, the device proved that a sightless operator can inspect outer races of bearings at a rate rapid enough to bear comparison with that of a sighted operator.

Manufacturing details of the device, developed by Timken engineers so that the company could give employment to blind civilians and to aid in the re-employment of Timken veterans, will be released without charge to any interested manufacturer, according to company officials.

Helen Keller, banked by Polly Thomson, her constant companion for more than thirty years, was on hand to reflect what the new stage may come to mean to thousands whose blindness keeps them from earning a living.

The Timken Roller Bearing Co., who uses the gage in the final inspection stage of its precision manufacturing, is the first industrial employer in Ohio—and one of the first in the United States—to employ blind persons. At present more than fifty partially or totally blind people are employed in various operations at Timken plants in Canton, Columbus, Zanesville, Mt. Vernon, Wooster, and Newton Falls, Ohio.

Shown at the same time was a standard Timken Outside Diameter Gage operated by a sighted employee. The standard gage, equipped with the new electronic sound device, makes up the blind operator's unit.

At a specially-built assembly line consisting of two work benches—on one of which the new gage was installed—two operators, one blind and one sighted, demonstrated how both the standard gage and the gage for blind operators are used to precision-check the outside diameter of Timken

bearing races to within one twenty-five millionth of an inch.

Diameters of rolls, cone, and cups, the components of Timken bearings, are ground within very close limits of their specified sizes. Each part is then checked for size in the final inspection departments, where the operators use precision gages with electrical or mechanical dial-type indicators. The indicators show highly enlarged (or amplified) readings of variations in the diameter of the work-piece being checked (in this case a bearing part). Parts with diameters over or under the specified size limit—or out of round—are readily detected and removed.

To enable a blind operator to do this work with the same accuracy, a sound indicator is used on the same type of gage. There is a small, cone-type speaker mounted on the back of the operator's chair and connected with the electronic device. The operator hears three different notes issuing from the loud-speaker An article that is normal or within the size limit is indicated to the blind operator by the sound of the middle note. This means the article may be passed as meeting the rigid Timken standards. The high note indicates the article is over-size, while the low note indicates that it is undersize. At the sound of either of these notes, the operator rejects the article under inspection.

The three notes are produced by an electronic oscillator which is controlled by relays connected to the three indicator lights of the electronic gaging system. The red, green and orange indicator lights correspond to the three notes of the sound device, the red being high, the green low and the orange middle. Chief purpose of the indicator lights is to give the lineman (who sets up each gage) a quick visual check on the gage's efficiency. The gage is originally set and is adjusted to the master gage and can be made to give both a visual and sound indication as close as one five-millionth of an inch over or under a specified diameter tolerance.

Timken engineers spent almost two years in experimenting with various gages before a satisfactory one was found. First gage to be developed was a "braille" gage. With this model, the article to be gaged was pushed between two points (representing the proper diameter of the article) in a horizontal plane electrically connected to a finger block. The contact of the article raised the first, second or third of these points on a vertical plane. The first stood

for a passable part, the second for one too small, the third for one too large. But this was considered too cumbersome for wide application.

The second gage to be developed in the evolutionary process was an electronic gage, suggested by a Timken official whose flying experience had made him familiar with the "A" and "N" signals that guide pilots on their course. In this model, the operator was required to wear an earphone through which he heard a dot and a dash (Morse code the letter "A") if the article was too small. If the article was too large he heard the reverse of a dash and a dot (Morse for "N"). If the article was passable he heard both signals and they joined to produce a continuous tone. But in this instance, minute high and low spots in the surface of the article interfered with the transmission of the "A" and "N" signals and the gage had to be abandoned.

The third gage was also an electronic one with the indicator continuously sounding at a high, low, and normal pitch into earphones. After a few days, the experimental operator objected to the constant sound in his ears. To overcome this, a photo-electric cell was installed which cast a beam of light across the gage block (on which the piece being gaged is placed) so that when no work was in the gage the sound was cut off. But again the operator objected because the earphones deprived him of any outside sound, making him feel closed-in and helpless.

A final model proved satisfactory to the operator and the lineman and is the one now in operation.

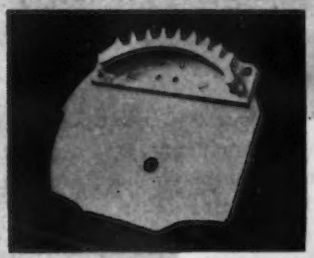
Captain Paul Moriary, A.A.F. pilot who suffered the loss of his sight, a broken neck, a fractured jaw, and a chipped knee when his small spotter plane was shot down in flames over Germany, was present at the demonstration. He is now a patient at Valley Forge General Hospital.

Factory Indexes Decline

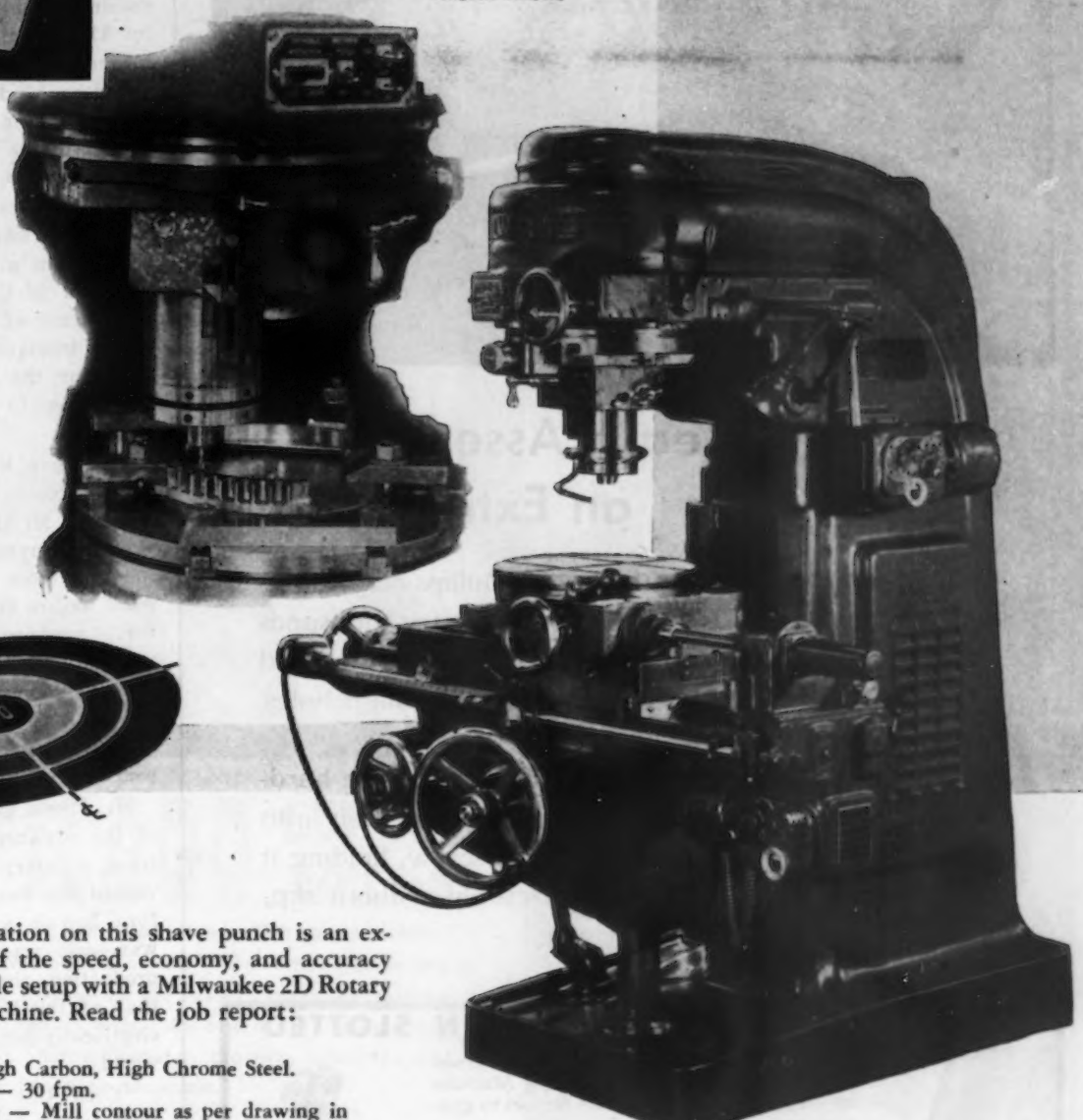
Chicago

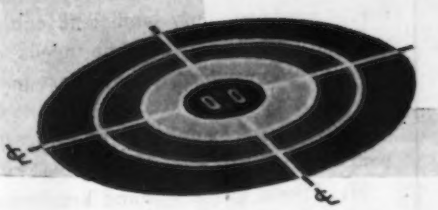
• • • **For the sixth** consecutive month the indexes of factory employment and payrolls compiled by the Chicago Association of Commerce declined during June. Respective June figures were 138.2 and 275.4 compared with 140.1 and 276.5 for May and 155.1 and 299.4 for June. 1944.

Can you Complete this Shave Punch Milling Job in 60 hours?



Material Courtesy National Cash Register Company





The milling operation on this shave punch is an excellent example of the speed, economy, and accuracy obtained in a single setup with a Milwaukee 2D Rotary Head Milling Machine. Read the job report:

Shave Punch
Material — High Carbon, High Chrome Steel.
Cutting Speed — 30 fpm.
Operation Data — Mill contour as per drawing in one setup. Depth of contour 1-5/16"

Time Distribution — Setup and layout - -	6 hrs.
Rough mill contour to .005" - - -	25 hrs.
Finish mill to .0005" - - - - - - -	29 hrs.
.0000"	
Total time - - - - - - - - - - -	60 hrs.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills intricate shapes in a single setup without the aid of templets or models — transmitting blueprint dimensions and outlines directly to the workpiece.

ACCURATE . . . chances for error are eliminated because there is no change in setup. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and setup time are reduced to the minimum. Accurate performance of the machine saves operator's time and results in rapid production of work otherwise difficult to perform.

Write for Bulletin No. 1002C and complete information.

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Germany's Electrical Equipment Industry Great Despite Bombs

Pittsburgh

• • • Conquered Germany's electrical equipment industry, still grossly expanded despite 40 pct destruction by Allied bombs, must be trimmed to normal peacetime production levels, Charles A. Powel, newly-appointed chief of the electrical and radio branch of the Allied Control Commission, declared. Mr. Powel, president of the American Institute of Electrical Engineers, was the guest of honor at a luncheon given by the Pittsburgh Chamber of Commerce recently. He takes leave of absence from his position of headquarters engineering manager for the Westinghouse Electric Corp. to go to Germany to assume his new post.

"We know that the electrical equipment industry is vital to the waging of war," Mr. Powel asserted, "yet it would be impracticable to blot out this industry from the Reich. Instead, we must assure that the industry henceforth produces only sufficient equipment to fill the peacetime needs of Germany and even then we must keep a careful check on that equipment to see that applications are in line with peacetime pursuits."

Mr. Powel has first-hand knowledge of the expansion of Germany's electrical industry in prewar years. He visited the Reich in 1938—a year before Britain and the Nazis went to war—and was amazed to find that production there probably exceeded that of the United States, the most electrically-minded country in the world.

"With this in mind," Mr. Powel said, "my first task under the Allied Control Commission will be to make a complete survey to determine just how greatly this expansion overshot the nation's normal needs. We will study the Reich's normal needs per year for a period as far back as, perhaps, 15 yr. We will then study the extent and nature of existing facilities and recommend to the commission a basis for permissible future activity of the industry."

Mr. Powel said his survey probably would take him to all parts of Germany where electrical equipment factories exist, including zones occupied by the British, French and Russians

CHICAGO CUT-OFF WHEELS

From the swift era of war production comes another modern miracle, the cut-off wheel—man power and man hour saver—for the fastest, smoothest method of cutting tubing, wire, steel and brass sheets, glass, porcelain, Stellite, tungsten, plastics, laminates and other hard-to-slice materials.

When RT, the special formula bond was developed, it put the cool-running CHICAGOS 'way out in front in real performance records.

Available in rubber or resinoid—a full range of styles and sizes. 3 bond types—for every operation.

WANT TO TRY ONE? Tell us what you have to cut, grinder you use and size wheel you'd like. We'll send a test wheel promptly. *Write for Circular.*

CHICAGO WHEEL & MFG. CO.

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MADE WITH RT

THE NEW BOND THAT HOLDS ITS OWN . . . GIVES ONLY WHEN IT MUST!

Send CIRCULAR ___ SEND TEST WHEEL ___ SIZE ___ TO CUT ___

NAME _____

ADDRESS _____

CITY _____ STATE _____

as well as the American occupied sector.

While advocating that Germany be permitted a certain amount of industry—manufacturing to which it is naturally suited—Mr. Powel pointed out the danger of the possibility that the Allied Nations may become "soft" after a short period of control in Germany.

"I am convinced that strict control over Germany must be maintained for two generations — 40 to 50 yr — so that the thinking of the people can be changed by education," he said. "If we keep going for five years and then grow soft, we will have lost the war.

"Somewhere between the two extremes of making Germany a completely agrarian nation, as advocated by some, and allowing it any and all industries on the basis that they are essential to European economy, as advocated by others, there must lie a middle road. This middle road will permit the Germans a satisfactory balance between agriculture and industry and give them a decent standard of living without allowing them to establish a new war potential."

Mr. Powel reiterated his belief in the merits of a plan previously suggested by him jointly with presidents of four other major engineering societies—civil, mining, mechanical and chemical. This plan advocates the banishment of three important German industries vital to war, and heavy cuts in two other industries on the basis that the country is not naturally suited to such manufacture and the plants have been built up only under a false wartime economy. Industries this plan would ban or curtail are:

1. Synthetic oil. Germany should be made to import all its oil and this importation should be limited to normal peacetime needs. It has little natural oil resources.

2. Eliminate aircraft plants and equipment. Germany's civilian needs of airplanes should not be more than 100 per year. They should be made to purchase these abroad.

3. Destroy all aluminum and magnesium plants. There are no bauxite deposits in Germany, therefore no justification for the industry.

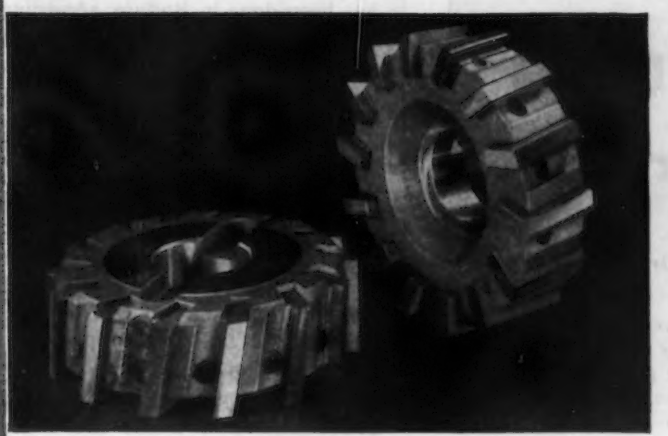
4. Eliminate 75 pct of Germany's synthetic nitrogen plants as this is a principal ingredient of explosives.

5. Eliminate 50 pct of Germany's steelmaking capacity.

Ingersoll FACE MILLS

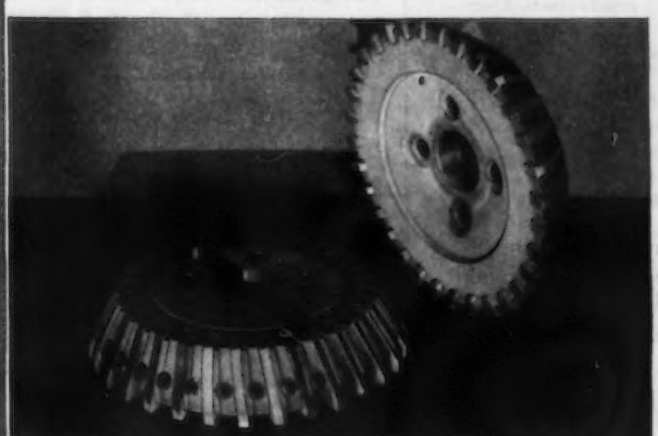
WHEN TO USE EACH OF FOUR BASIC DESIGNS

INGERSOLL presents four standard types of face mills, each designed for a particular class of work. All types are furnished with high speed steel, cast alloy, or carbide tipped blades; and are available in medium, heavy, and extra heavy series to accommodate different amounts of stock. Send us a complete description of your particular operation so we can recommend the proper series. Ask for a field engineer to call and make a survey of your requirements.



TYPE NX is a general purpose face mill recommended where a cutter of general application is required capable of taking heavy cuts on both face and periphery in cast iron and steel. There is no cutter which we can recommend as being more generally useful for medium and heavy milling.

SHEAR CLEAR is a patented face milling cutter designed particularly for continuous chip materials. The discovery of new blade angles makes possible faster feeds, smoother finish, longer tool life and less power required. Will outperform any other face mill on flat surfaces. Will not cut into a corner.



CONE TYPE face mills are widely used general purpose cutters with lowest replacement blade cost. Suitable for small steps and shoulders. Medium duty used extensively for high production milling of cast iron, and extra heavy duty suitable for heaviest cuts on cast iron or steel.

RAY BLADE face mills are intended for high production milling of cast iron. Particularly recommended for use with Rexalloy or other cast alloy blades. Both roughing and finishing types available with interchangeable blades.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

Manufacturers of Inserted Blade Milling and Boring Tools

Chevrolet Centers Plane Power Plant Output in Buffalo

Buffalo

• • • **The Chevrolet Motor** Division of General Motors Corp. has announced plans to concentrate its aircraft engine production in the Buffalo area to free other plants for the manufacture of civilian goods.

While all the final assembly, testing and shipping of aircraft engines has been done in Buffalo, according to a statement by Marvin E. Coyle of Detroit, vice president of G.M. and general manager of the Chevrolet Division, many of the integral parts, such as cylinder heads, gears, rough forgings, etc., were produced in other plants, chiefly in the Michigan-Ohio-Indiana area.

"With the transfer of the majority of these operations to the Buffalo plants," he said, "we will be able to free certain facilities to prepare for civilian and other production."

Mr. Coyle's statement also said that Chevrolet's area plants are engaged in the "difficult task of producing a new type of gas turbine engine designed to give future aircraft greater speed, ranges and ceiling."

The River Road motor and axle plant of Chevrolet was closed from July 28 to August 1 to take inventory. A spokesman said there has been no change in the company's contracts for the production of Pratt & Whitney engines for warplanes.

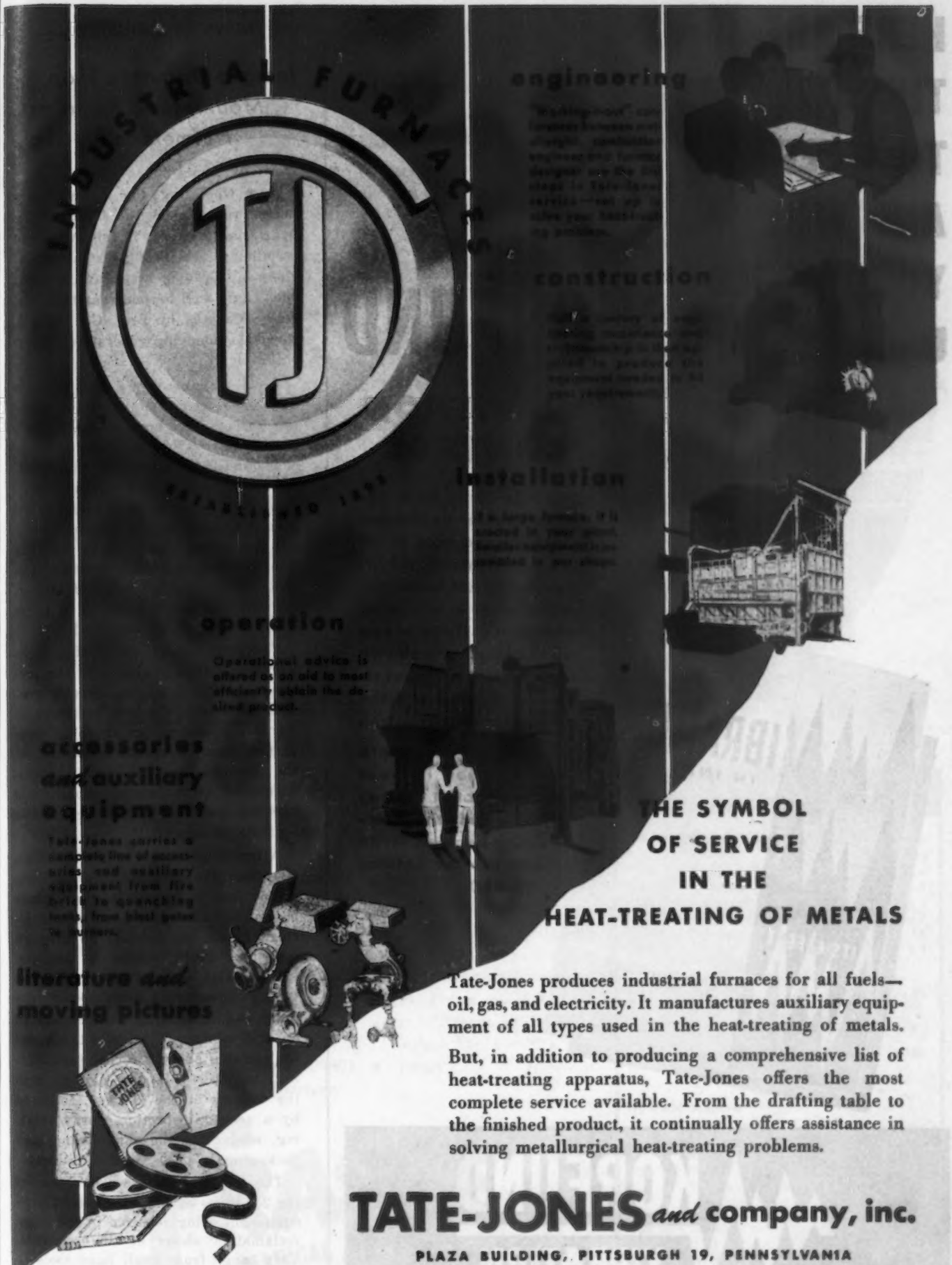
National Carbon Halts Naval Plant Conversion

Buffalo

• • • **The National** Carbon Co. has abandoned plans for the manufacture of a "hush-hush" war product for the Navy at the government-owned plant in Cheektowaga formerly operated by the Buffalo Arms Corp.

National Carbon began refitting the plant in the Spring and was ready to start production when the order was cancelled. A notice posted at the plant informed employees that supplies of the secret product now exceed Navy requirements.

While 150 workers will be laid off, the plant will be maintained in readiness for production for an indefinite period. Original plans had called for employment eventually running into the thousands.



THE SYMBOL OF SERVICE IN THE HEAT-TREATING OF METALS

Tate-Jones produces industrial furnaces for all fuels—oil, gas, and electricity. It manufactures auxiliary equipment of all types used in the heat-treating of metals.

But, in addition to producing a comprehensive list of heat-treating apparatus, Tate-Jones offers the most complete service available. From the drafting table to the finished product, it continually offers assistance in solving metallurgical heat-treating problems.

Films on actual quenching procedure are available on request. Periodically, literature on new equipment and recommendations for use is distributed. If you are not receiving it, send us your name, position and affiliation.

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Gas and Oil Fired • Electric • Pusher • Variable Speed Conveyor • Rotating Hearth • Car Bottom • Roll Down • Horizontal and Vertical Pit • Circular and Rectangular Pot Furnaces • Oil, Gas and Combination Burners • Steel Fabricators

Equipment for Cycle Annealing • Austempering • Martempering • Pernellizing

Indiana Ordnance Shop Modifies and Reclaims Helmets on Big Scale

Jeffersonville, Ind.

• • • Operating the Army's only helmet repair shop, the Jeffersonville quartermaster depot is modifying and reclaiming steel helmets at a rate of close to 35,000 a week and expects soon to go well beyond that figure, it was announced by Brig. Gen. Guy I. Rowe, commanding general of the installation.

From training camps and stations all over the continental United States, the helmets have been coming to Jeffersonville by the hundreds of thousands and in all degrees of unserviceability. There, after a careful inspection, they go through a high-geared production line that in less than forty minutes turns them out in fighting trim once again. The program has not only saved huge sums of money, but has also made available a large stock pile of manganese steel.

Under the supervision of Maj. R. E. Kuhlman, officer in charge of the reclamation branch of the depot's production division, German prisoners of war are operating an unbroken production line. From 25 to 35 pct of the helmets sent in have cracks, burns, or dents beyond repair, and are consigned to the salvage officer for sale as scrap.

After inspection, the old D-rings, to which are attached the buckling straps, are removed; in their place is spot-welded a new-type, hinged D-ring. In all, the helmets go through ten steps which include—in addition to inspection and the removal of the D-rings—grinding, stripping off the paint and immersing the helmets in an acid solution to prepare the metal for painting and to prevent rust, drying, buffing for spot welding, then the welding of the D-rings, followed by a second inspection, spray-painting, sewing on the chin straps, and packaging in pasteboard containers.

The helmets comprise but one of the 250 items of Quartermaster Corps equipment being repaired in the huge reclamation shops at Jeffersonville. They range from small hand tools to 10-ton cranes, forklift trucks, tents and heavy textiles, fuel and lubricating equipment, field ovens, and fire units. The head of the Production Division is Lt. Col. Charles E. Hinckley.

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Type 303 Rounds	1/16" to 6"
Type 416 Rounds	3/32" to 4"
Type 303 Hexagons	5/32" to 2"
Type 416 Hexagons	1/4" to 2"
Type 302 Squares	1/4" to 2"
Type 303 Squares	1/8" to 3/16"
Type 302 Flats	1/8" x 3/8" to 1" x 4"

SHEETS AND PLATES

Type 302 .019" (26 ga.) to .250" (1/4")—24" x 96" to 48" x 120"

STRIP

Type 302 . . .010" to .062"—12" to 24" x 120"
Also in spring temper

TUBING

Type 304 Seamless
1/8" to 5" O.D. x 20 ga. to 1/4" wal.
Type 304 Welded
3/8" to 1½" O.D. x 18 ga. to 16 ga. wal.
Type 347 Welded
3/8" to 3½" O.D. x 20 ga. to 16 ga. wal

PIPE

Type 304 Seamless	.1/8" SPS to 6" SPS —1/8" EHPS to 4" EHPS
Type 304 Welded	1/8" SPS to 2" SPS
Type 316 Seamless	1/2" SPS to 2" SPS
Type 316 Welded	1/2" SPS to 2" SPS
Type 347 Seamless	1/2" SPS to 3" SPS

CARBON, ALLOY AND STAINLESS STEEL BARS, TUBES, SHEETS, STRIP AND WIRE

T-Loans Not Used For Cancellation Capital

Chicago

• • • **Relatively small use has been made of the government's T-loan program designed to free working capital frozen by contract cancellations, according to the Federal Reserve Bank here.**

From Sept. 13, 1944, when the first T-loan guarantee agreement was made in this district, until VE-Day, the Federal Reserve Bank of Chicago approved 124 T-loan agreements totaling $76,166,581. From VE-Day until July 1 loans were made raising the cumulative commitment total to $103,411,481. Of the 164 loan agreements, 23 totalling $12,405,000 were arranged through the Detroit branch. It is estimated that in the seventh district, comprising most of Illinois, Indiana, Michigan, and Wisconsin, and all of Iowa, 7500 or more prime and sub-contractors are eligible under the program.

LeTourneau, to Establish Branch Plant in England

Peoria, Ill.

• • • **R. G. LeTourneau, Inc.,** will establish a branch factory at an unnamed location in England, company officials have announced.

Designated as managing director of the new plant is Brig. W. E. R. Blood, now in charge of the British army engineers' headquarters in Washington, D. C. Maurice Foote, currently superintendent of LeTourneau plant No. 1 at Peoria will be superintendent. Now in England to inaugurate action on the subject and to select the necessary plant properties is Denn M. Burgess, executive vice-president of the company.

The British branch will generally follow the lines of LeTourneau (Aust.) Pty. Ltd. at Rydalmere near Sydney, Australia.

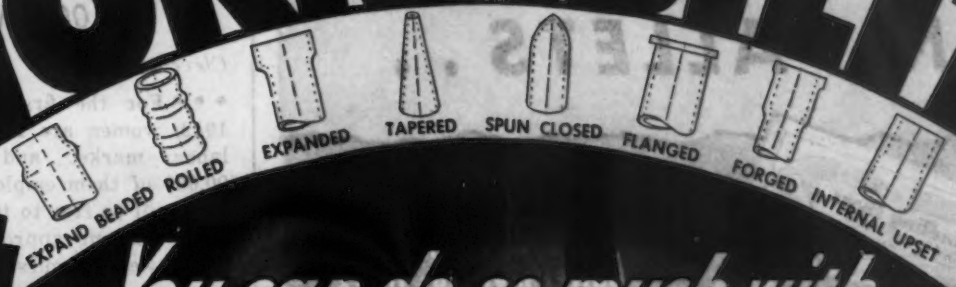
Will Build 14 Cargo Ships

Birmingham

• • • **Ingalls Shipbuilding** Corp., Birmingham, has received a contract from the Brazilian government for 14 cargo ships of C-2 Brazilian design to be delivered in 1946.

Total base price for the ships is $38,310,000. They will be built at the corporation's Pascagoula, Miss., shipyard.

WORKABILITY



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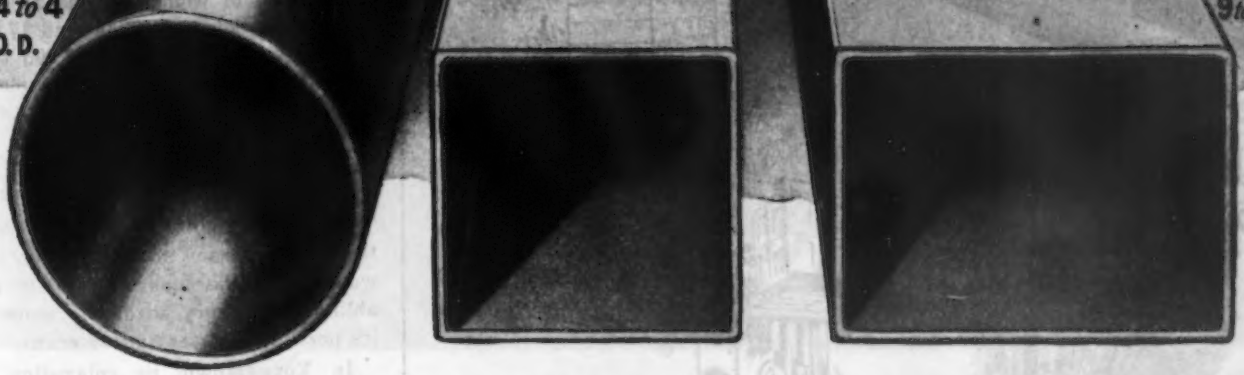

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Engineering advice and technical help in the selection of tubing best suited to meet your needs.

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Ohio Women Free Of WMC Controls; Says 90,000 Are Affected

Cleveland, Ohio

• • • **For the first time since late 1942, women are free agents in the labor market and approximately 90,000 of them employed in war jobs here will be free to take any job they want without approval of the War Manpower Commission.**

Men will continue to be governed by manpower regulations because USES has requests from industry for 16,000 men. Of these, 4200 are needed by companies holding priority contracts, and 2200 are needed by companies making "top urgency" materiel.

While release of women workers from WMC controls indicated a slight easing of the manpower pinch here since VE-Day, Stuart R. Smith, WMC area director, urged women to stay on the job and pointed out that the number of women in war production is now between 12,000 and 17,000 off the wartime high of 102,000 that prevailed in late 1943. No consideration was given to any immediate suspensions of controls over men.

According to Mr. Smith, 40 pct of the 2500 persons contacting USES daily are women and releasing the women from manpower controls would ease the load on USES, enabling the agency to devote more of its personnel to serving veterans.

In Youngstown, no relaxation of war manpower controls will occur until the needs of the district's steel mills are met, according to war manpower officials.

With the area still listed as critical, these facts are outstanding in the Youngstown labor market:

More than 2000 men are needed immediately for vital jobs in the steel mills. At least several hundred men could be put to work by the railroads in the Youngstown area.

Youngstown WMC officials revealed this week that recruiting is underway in the South to obtain workers for valley steel mills. Cutbacks in war orders at the various fabricating plants in the district have not as yet reflected in re-employment request at the USES Office. During the first six months of the year, this office made approximately 23,613 placements in the Youngstown area, representing a decrease of 24.3 pct

THE long lasting accuracy of Logan Lathes is due in large part to the construction of the Logan Lathe bed. The extra heavy, sturdy ribbed, special analysis castings are alloyed to obtain the finest lathe bed characteristics, and are designed for sections of even thickness to reduce internal strains. How these rugged castings are planed, aged, milled, machine scraped, finish-milled, precision ground, and checked is too complex a story of accurate and efficient workmanship to be fully told here. The important aging period which follows the rough cut, for example, allows more than adequate time for maximum development of any latent tendencies to distortion. In milling, nine formed cutters perform nine heavy milling cuts simultaneously in a single pass to bring the ways to within .0015" of finished specifications. Then the mechanical scraping, the finish milling, and the final precision grind bring the ways to within .0005" of parallelism over their entire operating area. It is care like this, not only in making the bed, but in building the complete machine, that makes the Logan Lathe dependably accurate in the tool room and in high-speed production. Ask your Logan dealer, or write direct for catalog information on all models of Logan Lathes.

No. 820
Quick Change
Gear Lathe

No. 840
Quick Change
Gear Turret
Lathe

SPECIFICATIONS common to all Logan Lathes: Swing over bed, 10½", Bed width across ways, 6-15/16", Bed length, 43⅛", Size of hole through spindle, 25/32", Spindle nose diameter and threads per inch, 1½"—8, 12 Spindle speeds 30 to 1450 r.p.m., size of motor ⅓ or ½ h.p., 1750 r.p.m.; Preloaded precision ball bearing spindle mounting; Drum type reversing motor switch and cord; Precision ground ways, 2 prismatic "V" ways, and 2 flat ways.

LOGAN ENGINEERING CO.

CHICAGO 30, ILLINOIS

E-1

from the corresponding period in 1944.

Priority placements of men during the six-month period totaled 3273 and despite current cutbacks there are 2084 unfilled priorities existing today. Priority placements from January to June included 2144 in Youngstown, 629 in Warren, 234 in Niles, 235 in Salem and 31 in East Liverpool. Job placements in Ohio in the six months totaled 363,989.

AFA Holds National Administration Meet

Chicago

• • • **New officers and directors** of the American Foundrymen's Assn. were elected at a 1945 Administration Congress held recently at the Palmer House. The following national officers were elected at the three-day meeting: F. J. Walls, International Nickel Co., Detroit, president, S. V. Wood, Minneapolis Electric Steel Castings Co., vice president.

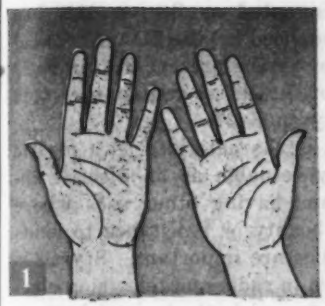
F. J. Walls

S. V. Wood

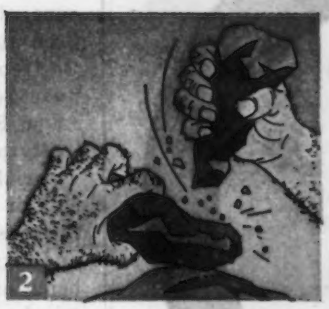
George K. Dreher, Ampco Metals, Inc., Milwaukee; E. W. Horlbein, Gibson & Kirk Co., Baltimore; H. H. Judson, Goulds Pumps, Seneca Falls, N. Y.; James H. Smith, Accessories Group, G.M., Detroit; F. M. Wittlinger, Texas Electric Steel Castings Co., Houston, and retiring president R. J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich., were elected directors.

Held in accordance with Office of Defense Transportation orders the meeting brought together the local chapter chairmen for a group meeting in place of the annual convention of the membership. The annual business meeting was held in the form of a dinner, and a digest of the 1945 Foundation Lecture on the "Solidification of Metals" was presented. In the absence of H. A. Schwartz, National Malleable and Steel Castings Co., Cleveland, the foundation lecturer, the digest was presented by F. G. Sefing, International Nickel Co., New York.

It started with the other hand



Right or left-handed, your *other* hand is a type of jig.



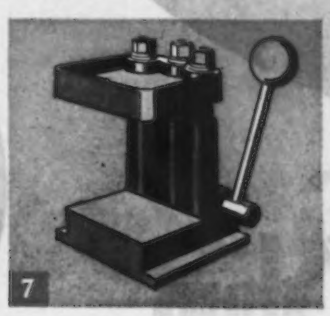
A jig is something to hold work while you're working on it.

Notches in stones or logs left both hands free.

Two heavy stones once served as a sort of vise or jig.

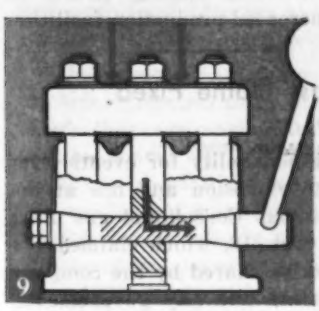
Modern adjustable jigs have two faults. Some slip, hurt people.

Locking mechanisms of others wear out fast or fail.

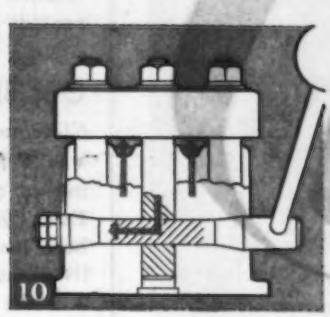


These problems were solved by Woodworth's CONE-LOK JIG.

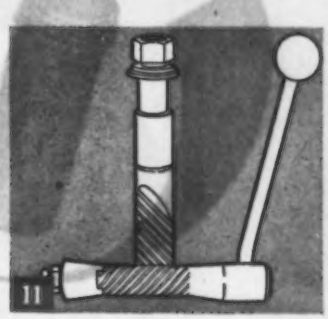
This amazing jig locks instantly. Can't slip. Protects workers.



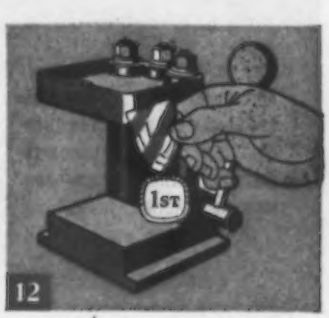
Force on top travels thru 45° gear to right. Left cone locks.



Force from below is transmitted to left . . . locks cone at right.



CONE-LOK JIG is simple. Three moving parts do the job.



CONE-LOK is praised by production men everywhere.

What Woodworth products mean to industry

THE contribution to mass production efficiency made by the CONE-LOK JIG is typical of all Woodworth products.

There is a reason for this.

Every Woodworth product must conform to the basic policy of this company . . . *to make only products which will benefit industry through increased production and reduced costs.*

This means that the great demand for Woodworth Tools and Gages will be continuing, especially in view of the coming battle for postwar markets.

And it means that Woodworth engineers have been charged with the responsibility of searching constantly for new ways to speed up and lower the cost of production, in connection with Woodworth products of the future.

The constant growth and expansion of the N. A. Woodworth Company is due to strict adherence to these objectives.

ACCURACY YOU W CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD, DETROIT 20, MICHIGAN

PRECISION GAGES

PRECISION MACHINED PARTS

PRECISION TOOLS

Dow Announcing New Polystyrene Product

Midland, Mich.

• • • A new and improved polystyrene, designated as Styron 411, has been announced by the Dow Chemical Co., replacing the present Styron K-27 as of Sept. 1. Prices remain the same as on Styron K-27.

Styron is characterized as a plastic especially valuable as an electric insulator and having other uses where lustrous beauty or resistance to acids and alkalies are important. Styron is being used in radio and television electrical parts and batteries and battery cases. The new polystyrene provides molders with such improvements as easier mold release, improved surfaces, superior welds, better flow control and the elimination of need for external lubrication, it is claimed. Increased weld strength and better machinability are also offered as advantages. Buffing operations are more easily performed.

In trimming the new material is said to show reduction in tendency to tear back or produce a laminar condition when cut at the gate.

Styron 411 is subject to WPB regulations. Dow is making efforts to provide increased production facilities.

Gas Blast Blame Fixed

Cleveland, Ohio

• • • Responsibility for events leading to the explosion and fire at the East Ohio Gas Co.'s liquid gas plant here last Oct. 18, which claimed 136 lives, must be shared by the company and the state and city governments, Coroner Samuel R. Gerber ruled.

In a special report on the disaster, the coroner recommended that, in view of the destruction caused by the disaster, no similar plant either potentially explosive or inflammable should be built in a residential, semi-residential, business or congested factory district. The East Ohio Gas Co. has already announced that it will not rebuild its gas storage facilities in the same vicinity.

The Pittsburgh-Des Moines Steel Co., subcontractors who installed the liquid gas storage tanks, was singled out for sharp criticism by the coroner.

"This company erred in judgment in the type of storage reservoir which they recommended," Dr. Gerber said. He pointed out that there had not been sufficient research to determine whether a cylindrical tank would prove safe for storage of liquid gas at low temperatures.

Low Tool Priority Seen Delaying Item In Reconversion Job

Chicago

• • • **An extensive machine** tool bottleneck in removal of machine tools from war plants and their installation and use by civilian industry is probable, the monthly review of the Federal Reserve Bank of Chicago states.

The bank also foresees some serious bottlenecks to reconversion in particular plants until necessary new tools can be built. Despite assignment of AA-3 ratings to 72 essential industries, it is stated that these ratings "have to date not been of great value to manufacturers because current war orders with higher priorities have kept most machine tool manufacturing facilities in full operation."

Delivery lags may be the controlling factor in inducing manufacturers anxious to resume the production of civilian goods to improvise and buy or rebuild used tools who ordinarily would be in the market for new equipment, the review says. Later, when new equipment becomes available, its purchase is considered likely.

"The greatest outlet for war-built machines promises to be in the plants where they are now installed which will be converted to peacetime production. In addition, many medium and small-sized manufacturing establishments will require more modern equipment to reconvert plants on a competitive basis with other, particularly larger, firms in their industries. Some of these smaller establishments, it is reported, have not been able to retool and modernize their plants during the war in contrast with many other larger war plants which have had higher priorities leading to the installation of new machine tools and related equipment.

Except where production tolerance requirements are very exacting, or where a very specialized machine is needed to do a particular job, used machinery seems likely to compete with new tools. This potential competition between new and used machine tools promises to be important for the bulk of the manufacturing firms in the Seventh Federal Reserve District, if the procedures for making surplus machine tools available to prospective buyers are streamlined and if the terms are financially attractive."

Great Lakes July Ore Shipments Down

Cleveland

• • • Shipments of Lake Superior iron ore from upper lake ports during July totaled 11,372,282 gross tons of which 11,296,404 tons were from U. S. ports and 75,878 tons from Canadian ports, Lake Superior Iron Ore Association reports. This compares with a total of 12,908,972 tons in July a year ago when U. S. port shipments totaled 12,844,348 and Canadian ports shipped 64,624 tons.

Cumulative shipments for the season to August 1 totaled 40,396,868, of which U. S. ports shipped 40,148,036 and Canadian ports shipped 248,832 tons. This compares with 42,046,047 tons from U. S. ports and 239,855 tons from Canadian ports to the same date a year for a total of 42,285,902 gross tons.

Ships loaded 11,372,282 gross tons, a decline of 11.9 pct from the 12,908,-972 tons a year ago. July's total compared with 10,621,309 in June this year, and 11,121,203 in May.

Taking August 1 as the theoretical mid-point in the navigation season on the lakes, a movement of close to 80,-000,000 tons will be made if the rate of the first six months continues. Loadings to August 1 totaled 40,396,-868 tons, 4.47 pct below the 42,285,902-ton comparable figure in 1944. Totals for the 1944 season were 81,170,538 tons.

Energy Needs Hit New Peak

Washington

• • • Electric energy requirements of the iron and steel industry will reach an all-time high of 23,945,-254,000 kw-hr in 1945, according to a report just released by the Federal Power Commission.

The report points out that American manufacturing and extracting industries will use more electric energy this year than was produced for all purposes in any year prior to 1940. Production in 1939, the peak year prior to 1940, totaled 161.3 billion kw-hr, while industrial use in 1945 will be about 161.7 billion kw-hr.

The first three industries in the order of their electric energy requirements for 1945 are chemicals, iron and steel and non-ferrous metals. This was also true for the preceding three years.

Prior to 1942 the iron and steel industry was the major consumer of electric energy, followed by chemicals and paper.

GEARED TO PROGRESS

Alloy Steels Designed for the Job

• This cluster gear takes a terrific beating in a truck transmission. Added to the grinding stresses of gear meshing with gear are the strains of temperature changes—broiling heat and bitter cold. It takes a specialized alloy steel manufactured under precision control to stand up under these conditions—a steel that is designed for the job.

Co-operating with motor truck engineers, Wisconsin Steel metallurgists developed an alloy steel that was just right. In this and countless other applications, they engineered the steel for the job it must do.

Constant experiment, constant scientific investigation make possible these masterpieces of metallurgy. Infinite care in production results in a uniformly excellent product. Together these factors have built Wisconsin's reputation for progress in alloy steel development.

Take your problem to our sales and metallurgical staffs. You can be sure that top-flight scientific skill will be applied to your specific steel requirements. Wisconsin is geared to progress!

WISCONSIN STEEL COMPANY
Affiliate of International Harvester Company
180 North Michigan Avenue Chicago 1, Illinois

WISCONSIN ALLOY STEELS

Allis-Chalmers To Expand In Indiana

Milwaukee

• • • **Allis-Chalmers Mfg. Co.**, Milwaukee, plans to spend more than $10,000,000 in expanding its La Porte, Ind., plant, following approval of its board of directors for a management plan to increase the firm's line of products.

Up to now the La Porte plant has been used to produce an all-crop harvester suitable for use on grains, beans, and seed crops, as well as for production of motor graders. The grader line, William A. Roberts, vice-president of the tractor division, said recently will now be produced at the firm's Springfield (Ill.) plant, which makes the crawler type tractors for Allis-Chalmers.

The harvesting machinery line will be expanded to include harvesting equipment for corn, hay and silage. The silage will be made in the field out of all grass crops or row crops such as corn or sorghums.

The additional plant floor space and equipment at La Porte will give the division from two to three times its present capacity, according to Roberts, who said the plant would be the most modern of its type in the world.

The field tractor division of Allis-Chalmers in Milwaukee will benefit some from the expansion since such parts as castings are made here for the La Porte plant.

The company has not yet reached a decision as to whether any expansion will be needed at its other farm equipment plants at La Crosse.

Check-Off Ordered by Board

Chicago

• • • **Maintenance of membership** and dues check-off has been ordered by the Sixth Regional War Labor Board in a dispute case involving the American Brake Shoe Co., Chicago Heights, and the United Steelworkers of America, Local 1136 (CIO).

Similar provisions were ordered at the Ross Gear & Tool Co., Lafayette, Ind., along with leaves of absence for union officers, and certain wage adjustments. The union was the United Auto Workers, Local 531 (CIO).

A modified maintenance of membership provision, binding only employees requesting it, was ordered at the Ladish Drop Forge Co., Cudahy, Wis., at which employees are represented by the International Brotherhood of Blacksmiths, Drop Forgers & Helpers, Local 509 (AFL).

Otiscoloy — the lighter, stronger, high-tensile J&L Steel—cuts structural weight with no loss of structural strength — lends itself to both hot and cold working — has adequate ductility and a high degree of weldability — resists abrasion and corrosion.

LIGHTER YET STRONGER

OTISCOLOY

SHEETS • PLATES • SHAPES

Otiscoloy is available in Plates, Sheets, Bars, Angles, Standard and Lightweight Channels, Standard and Junior Beams, Jal-Tread Floor Plate.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PENNSYLVANIA

Committee Recommends Orderly Development Of All Standards

Washington

• • • **Standards will have an ever-increasing importance that will ultimately affect the production and sale of all goods and provision must be made for their orderly development, according to a report submitted to Secretary of Commerce Henry A. Wallace by the Policy Committee on Standards.**

"The Committee believes," the report states, "that standards activities which involve negotiation, opinion, judgment or compromise, should be developed through individual and joint efforts of technical, manufacturing, merchandising and consumer groups.

"The Committee also believes that these efforts will need to be coordinated and promoted through a disinterested private agency organized to function in the broad public interest. It appears that this function can most logically be fulfilled by the American Standards Assn."

The further belief is expressed that the scope of the American Standards Assn. should be broadened so that it can handle any standards or standardization project which deserves national recognition "whether for raw materials, intermediate goods, production goods, consumer goods, or for safety or for engineering or for commercial transactions."

Takes SPB Assignment

Washington

• • • **Maj. Milton Levenson, chief of the scrap and salvage section, redistribution and salvage branch, in the Office of Chief of Ordnance, Washington, has been placed on the inactive list of the Army on request of Assistant Secretary of War Patterson, to accept the position of assistant director of the Material Div. of the Surplus Property Board with headquarters in the Department of Commerce building, Washington. This division of SPB will handle all matters pertaining to ferrous and nonferrous metals as well as many other materials. Major Levenson formerly was with the Roxbury Iron & Metal Co., Inc., Boston.**

Capt. Bernard Fabrikant has been promoted to succeed Major Levenson as chief of the scrap and salvage section of Ordnance. He formerly was with Dulion Steel Products Inc., New York.

Lift Restrictions On Metals and Bearings, Electronic Equipment

Washington

• • • **Removal of restrictions** on special sales of a large number of items, including five metals and electronic equipment, was provided for in an amendment to PR-13 announced last week by WPB. Special sales are defined as sales of a material or product by any person, including government agencies, who acquired or made it for use and not for sale or resale.

Most of the changes were made in list A, restrictions on special sales—domestic. Chromium, copper raw materials, Inconel, Monel and nickel, were deleted from the list.

Holders of anti-friction bearings who have been unable, within 15 days, to dispose of them to the produeer who made them on a mutually satisfactory basis, or to other producers, or on an AAA order, or on an AA-5 or higher rated order for incorporation into military orders, may now sell them freely.

Several changes were made in references to electronic parts and equipment. Electronic equipment, complete sets, and the following components were deleted: Oil impregnated power factor type and molded bakelite capacitors, wire woven resistors, other than precision and molded two-watt, coaxial cable, hermetically sealed and other transformers and reactors. Restrictions on selling the following were changed from AA-5 to AA-3, oil impregnated capacitors, relays, shock mounts and electrical indicator combat type instruments. Restriction on joint Army-Navy inspected radio and radar tubes continue AA-1 as formerly, and on all other tubes, except restricted tubes, from AA-5 to AA-3.

The number of restricted radio and radar tubes was changed on both List A and List B, restriction of special sales for export. Four tubes were removed from the list and seven added, making a total of 23 restricted tubes.

Plant Returned to Ford

Norfolk, Va.

• • • **Navy activities which** have occupied the Norfolk assembly plant of the Ford Motor Co. are being reduced and will be entirely completed in early November, according to present plans. The plant is scheduled to be returned to Ford by Nov. 15. The Navy took over this facility on Jan. 6, 1943.

YOU'LL CUT MACHINING COSTS WITH CASTINGS LIKE THESE

Because they are

PERMITE

PERMANENT MOLD CASTINGS

THE permanent mold process for aluminum alloy castings, as perfected at Permite, has eliminated machining operations entirely for many castings, and for others has reduced finishing work to the minimum.

Permite Permanent Mold Castings are **precision made** to tolerances as close as ±.010". There's less "dead" metal to remove. Time, labor and money are saved!

In addition to their precision tolerances, these castings have smooth surfaces and finer grain structures . . . are made to the highest standards of strength and uniformity.

Whatever your requirements in castings — permanent, semi-permanent, sand mold or die cast — Permite Engineers and Foundrymen place at your service their twenty-five years of experience in working with aluminum alloys. Let us show you how Permite Aluminum Alloy Castings may save you money.

ALUMINUM INDUSTRIES, Inc.

CINCINNATI 25, OHIO

Detroit: **809 New Center Building**

Chicago: **616 South Michigan Avenue**

New York: **9 Rockefeller Plaza**

Atlanta: **413 Grant Building**

PERMITE ALUMINUM ALLOY CASTINGS

Steel Construction Program Under Way

Follansbee, W. Va.

• • • **Mellon-Stuart Co., started construction recently for the Sheet Metal Specialty Co., a subsidiary of Follansbee Steel Corp., of extensive plant additions. There is a total of 25,000 sq ft to be completed by Oct. 1, with the buildings and equipment to cost about $225,000.**

The program will consist of three separate units. There will be an 81 x 81 ft addition to the present two-story building, which will be used entirely for production. Another two-story wing from the addition, 60 x 90 ft, will house a machine shop on the first floor and the second floor will be used for production. The third unit will be used for worker accommodations.

These additions are being made for expansion of production of war products and for postwar expansion.

Determining Surface Resistance Of Aluminum for Welding

(CONTINUED FROM PAGE 74)

the 100-ohm fixed resistances in the bridge the decade box reading gives direct values in microhms. When the 1000-ohm fixed resistances are used divide readings by ten.

The materials required for the bridge are as follows:

R_a = 500 amp 50 mv Weston shunt (100 microhm resistance).

R_a and R_c = two type 510 C decade resistances, 10-ohm steps to 100 (in tandem).

two type 510 D decade resistances, 100 ohm steps to 1000 (in tandem).

R_b and R_d = two type 500 D fixed resistance units, 100 ohm.

two type 500 H fixed resistance units, 1000 ohm.

Note: R_a, R_b, R_c, R_d are obtainable from General Radio Co., Cambridge, Mass.

G = table type galvanometer, Rubicon Co., Philadelphia. Catalog No. 3417.

Sensitivity 0.0044 amp per mm. Resistance = 58 ohm.

Period = 5.0 sec, critical damping resistance = 850 ohm.

R_g = 850 ohm resistor, Rubicon Co., to match galvanometer; two D.P.D.T. knife-edge switches (small).

A = 100 amp DC ammeter; any inexpensive one will do.

S_b = auto starter switch with knob for manual control.

Carbon pile rheostat, 16 2x2x½ in. carbon plates in stack with screw adjustment.

Mining Engineer Offers Iron Ore Conservation Measures to J. A. Krug

Eveleth, Minn.

• • • W. R. Van Slyke, mining engineer here who is superintendent for fee owners of mining properties, sent to the War Production Board on Aug. 1 a recommendation containing two proposals calculated to assure future supplies of high grade iron ore in the United States.

These are as follows: (1) Acquire absolute control of a 300 million to 400 million ton reserve of high grade, open pit ore in the Minnesota Mesabi Range of the Lake Superior iron ore district, and put and keep from a third to a half of this reserve in condition for instantaneous production. (2) Raise present iron ore values at the mines by at least one dollar per ton so as to make economically possible the large scale mining of underground ores and the beneficiation of various low grade ores, including taconite, as offsets against curtailed open pit operation. This can be done either by a flat increase in the Lake Erie price of iron ore or by combining a reduction to be effected in the tax burdens on iron ore and a reduction to be effected in upper Lake rail freights on iron ore with an increase in Lake Erie iron ore prices.

In support of his recommendations, Mr. Van Slyke quoted E. W. Davis, director of the Mines Experiment Station of the University of Minnesota, "Mesabi reserves of open pit ore, and open pit concentrate amounted to approximately 615 million tons on Jan. 1, 1944."

"Shipments of about 60 million tons in 1944 reduced these reserves to approximately 555 million tons," he said.

"Production in 1945 will leave reserves of approximately 500 million tons on Jan. 1, 1946.

"At present, underground reserves of merchantable Mesabi ore are estimated between 300 million and 400 million tons, while supplies of low grade ores, chiefly taconite, are seemingly inexhaustible," he said. "Underground reserves are now being mined in negligible amount on the Mesabi because, under current iron ore price ceilings, underground operations result in losses. The utilization of taconite also must wait upon an increase in iron ore values such as to justify the necessary heavy investment in large beneficiation plants.

"Questions to be worked out in con-

nection with the establishment of the suggested strategic reserve of iron ore would include: how the reserve properties are to be acquired; how the ownerships and leaseholds are to be recompensed for the impounding of private property; how much should be paid for the reserves, as well as the manner and times of payment; how the tax interests of state, county and local governmental divisions are to be equitably reconciled and adjusted; and by whom and on what basis the reserves are to be operated when a crisis impends."

Canadian Pig Iron, Steel Production Far Below Capacity

Toronto

• • • **Production of both steel and pig iron in Canada remain at about 15 pct and 30 pct, respectively, below rated capacity. However, steel makers point out that output is being maintained at virtual capacity of their labor supply, with many producers handicapped by shortage of skilled workers.**

Canadian mills are booked almost solid through this year on the more popular steel materials. Bars and sheets have large tonnages carryovers into first quarter of 1946. Plate and some light bar sizes are about the only items on which delivery against new orders can be obtained within a period of two to three months. On practically all other lines producers are accepting new orders on an if-and-when delivery basis.

For the month of June pig iron production showed a small gain at 159,046 net tons or 68.8 pct of rated capacity, compared with 155,574 net tons in May when output was at 67.3 pct. June was below the total of 161,899 tons reported for June, 1944. Output for June included 128,603 tons of basic iron, of which 7591 tons were for sale and the balance for further use of producing companies; 16,905 tons of foundry iron; and 13,540 tons of malleable iron, all the two latter grades being for sale.

Charges to blast furnaces in June included 288,975 tons of iron ore, 16,073 tons of mill cinder, scale, sinter, etc., and 9312 tons of scrap iron and steel. Nine furnaces were in blast out of a total of 14 in the country.

For the first half of this year ended June 30, pig iron production totalled

941,963 net tons, which compares with 949,523 tons in the first half of 1944 and 867,789 tons in the 1943 period.

Output of ferroalloys in June amounted to 18,473 net tons against 19,883 tons in the previous month and 17,906 tons in June last year. Production included ferrosilicon, silicomanganese, ferromanganese, ferrochrome, chrom-x, and ferrophosphorous. For the six months ending with June cumulative production totalled 98,672 net tons, compared with 91,242 tons in the 1944 period and 111,793 tons in 1943.

Production of steel ingots and castings for June amounted to 257,115 net tons or an average rate of 85.1 pct of rated capacity and compares with 267,643 tons in May when the rate was 88.6 pct, and with 240,750 tons produced in June 1944. Production for June included 244,792 tons of steel ingots and 12,323 tons of steel castings.

For the six months ending with June cumulative production of steel ingots and castings totalled 1,595,618 net tons compared with 1,512,583 tons in the like period of 1944 and 1,499,-153 tons in 1943.

Charges to steel furnaces in June included 125,127 tons of pig iron; 96,219 tons of scrap of consumers own make and 61,844 tons of purchased scrap.

Pesco Fuel Booster Pump Raises Aircraft Engine Power

Cleveland

• • • To meet the demand for increased engine power, faster climb and the higher altitude capabilities of modern aircraft, a fuel booster pump with more positive vapor separating characteristics to handle larger fuel flow under the more severe operating conditions has been announced by Pesco Products Co. division of Borg-Warner.

Now in volume production and in actual use on certain planes, the compact electric motor driven centrifugal pump, which incorporates a unique design, is providing good performance in delivery of bubble-free fuel.

The only moving element of the pump is a direct driven impeller-rotor with tapered impeller blades on one side and with shrouded blades on the other.

MACHINE TOOLS

. . . News and Market Activities

Industry's Cancellations to Top $150,000,000

Cleveland

• • • Ethereal evidence that V-J day was near, if not at hand, caught the machine tool industry in a beleagured moment. Only hours before Russia had declared war on Japan, raising at once the question of what was to be done about the $40,000,000 worth of machine tools, once scheduled for Uncle Joe, that have been in a state of suspended animation ever since VE-day.

With June's unfilled orders amounting to $257,000,000, of which more than $106,000,000 were unrated, it can be assumed that cancellations in the immediate neighborhood of $150,000,000 are on the way. Automobile companies have entered an estimated $30,000,000 on machine tool books, but at the same time there is a considerable amount of essential war business also entered and in some cases in process, without ratings. These factors, of course, will not cancel each other out, but they are tangible indication of the confusion that will be inherent in switching around.

Many builders have new things to announce, things that have been withheld during recent weeks primarily because delivery dates were contingent upon the end of hostilities with the Japs. Inventories, of course, have also been a factor. Now announcements are in order and will certainly be forthcoming, perhaps proving surprising adjuncts to conventional machine tool lines.

Builders have been getting material pretty well and going along toward reconversion as far as conditions have permitted. Now, it seems that nothing is in the way except the customers. In a situation like this it would not be surprising if many people hesitated for a while simply to see how things go and what their competitors have up postwar sleeves.

Probably the salvation of some builders will be the orders they already have on the books. Others, whose machines are relatively new products and for which the peacetime market is far greater than the war market, simply because it hasn't begun to touch the field it should cover, are going to go ahead and build for stock, taking the gamble that when people get back to earth the tools will be ready for them.

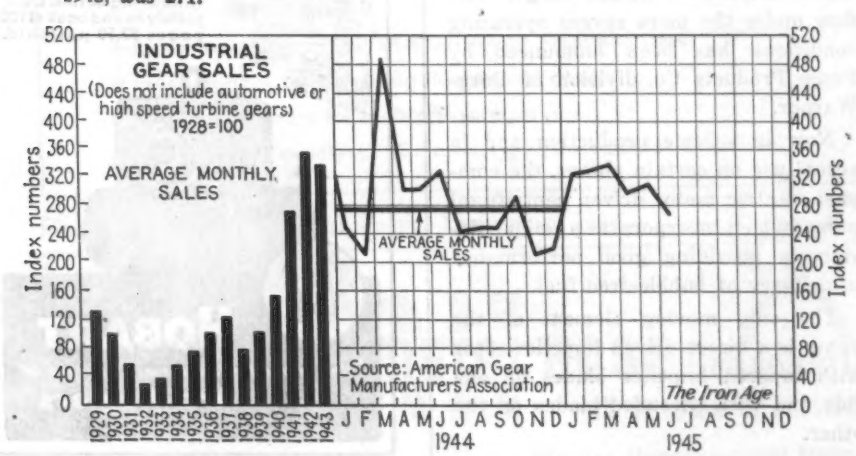
Less than six months should see the debris clear away and in that interval European customers may come through. Others, principally the domestic variety, may wait and see just how much equipment will be released by the armed forces. And these customers, to a considerable extent, control the ultimate disposition of surplus equipment on the open market. In any event, the builders are eventually going to be in for some tough sledding and most of them are well aware of it.

In Cincinnati, except for accelerated thinking on postwar problems, the apparent proximity of VJ-Day has occasioned little change. Builders naturally are wondering about the extent of cancellations that will inevitably follow the official proclamation of peace, and in the interval, carefully reviewing order books.

Currently, new business is not large, and reconversion orders are not outstanding. Some plants have given indication of sufficient backlogs to carry them toward the end of the year, and a few into 1946. Cancellations received to date have been telling, but not disrupting.

Generally, production has been steady and many plants have been pressed for delivery, which in some instances has amounted to a race against anticipated cancellations. These machines, apparently, will be useful in reconversion programs.

GEAR SALES: *The gearing industry, as represented by the members of the American Gear Manufacturers Assn., shows a decrease in volume of sales for June,* 1945, *as compared with May,* 1945, *of* 12 *and* 3/10 *pct. This report does not include turbine or propulsion gearing. The index figure for June,* 1945, *was* 271.



National Acme Net Up in Second Quarter

Cleveland

• • • National Acme Co. has reported net income for the three months ended June 30 at $446,930 after all charges including provision of $3,201,400 for federal taxes on income, possible refund on renegotiation, postwar adjustments and general contingencies. Net is equal to 89c. a share. In the second quarter of 1944 National Acme reported net income of $313,568, equal to 63 cents a share.

Renegotiation for 1944 has been completed and agreement reached requiring a gross refund of $5,600,000. This refund will not result in any change in the net profit of $1,731,780 indicated in the 1944 annual report.

NON-FERROUS METALS

. . . News and Market Activities

Intangibles Confuse Brass Mills' Plans

New York

• • • **Copper producers report orders** from customers for September delivery are expected to require full domestic production. However, brass mills are said to be approaching the end of the war with a great deal of confusion in estimating copper and zinc requirements based on production volume. Mills cannot mature their plans since they have not been able to anticipate the probable extent of cutbacks nor the speed of reconversion developments based on shortages of critical materials and components such as tin, ball bearings, fractional horsepower motors and others.

Brass mills are said to anticipate a period of confusion when the services cancel military orders.

Copper deliveries during July reported by the Copper Institute have dropped to 88,661 net tons, the lowest delivery volume since the war began and down 5370 tons from the previous month. Approximately this amount, 5428 tons, has been carried to inventory, which totaled 76,166 tons at refineries, on consignment and in exchange warehouses at the end of July. Meanwhile production holds steady at 73,466 tons of mine or smelter production and 72,995 tons of refined production, the latter a small drop from last month's figure.

•

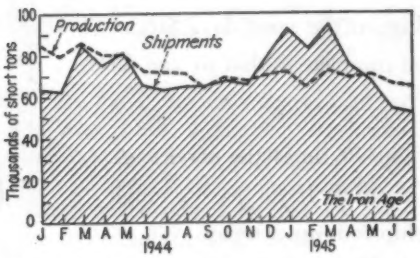
Expect Lead Modification

New York

• • • **Information from** the trade is to the effect that the lead stockpile continues at 100,000 lb due to the stringency of the lead control order and also to several recent arrivals of shipments.

There is speculation here that a further relaxation of the lead control order may be expected at some time in the next several weeks releasing increased quantities of lead for pigments and certain other chemicals. Factors in the trade point to the fact that such relaxations when received may serve to augment the number of jobs available to returning veterans.

The lead control order, M-38, was last modified a month ago.



ZINC SUPPLY: ***Production of slab zinc continues to outstrip consumption in July, with the stockpile climbing again to 197,004 net tons. Statistics from The American Zinc Institute.***

•

Tin Restrictions Tightened by WPB

Washington

• • • **New tin restrictions** which stipulate that producers of all alloys containing tin must limit quarterly consumption to conform with individual quotas have been announced by WPB. Under the provisions of Directive 2 to order M-43, a producer of solder, babbit metal, brass, bronze, copper base alloy ingots and all other alloys containing tin may no longer exceed his allocation even if the supply on hand would otherwise permit it.

The direction also provides that users of alloys containing tin, other than copper base controlled alloys, are not permitted to accept deliveries of tin alloys that would raise their inventories in excess of a 30-day supply. Copper base alloy controlled material users are allowed to accept tin deliveries up to a 60-day inventory.

Fisher Body to Reopen St. Louis Assembly Plant

Detroit

• • • **The General Motors** Fisher Body Div. will resume operation of its St. Louis, Mo., plant as soon as the plant can be reconverted to civilian production. It will then assemble bodies for Chevrolet passenger cars.

Bernard H. Sweeney has been reappointed resident manager of the plant. He served in that capacity from November, 1939 to January, 1942, when he was appointed resident manager of the Fisher Body tank plant at Grand Blanc, Mich., holding that position until January of last year, when he was named staff assistant in the Fisher Body aircraft section at Detroit.

June Production Of Molybdenum Lowest Since Mid 1941 Rate

New York

• • • **The production of** molybdenum concentrates fell off by 16 pct in June to 2,681,1000 lb of contained molybdenum. This is the lowest monthly production rate since the Bureau of Mines began to compile these statistics in the middle of 1941. In contrast, recent production figures have averaged something over 3 million lb monthly. Shipments during June of 3,379,400 lb on the other hand have continued at recent levels averaging 3.3 million lb, bringing producers' and consumers' inventories at the end of June down by 1.2 million lb of contained molybdenum. Combined inventories at the end of May had already dropped 0.7 million lb below recent levels. June stocks at producers' plants dropped to 12,611,800 lb, and at consumers' plants 3,933,140.

•

Slab Zinc Stockpile Moves Upward Again; Ample Supply Available

New York

• • • **The market for** slab zinc is quiet according to producers here and September order books have been opened. While there are ample supplies of zinc available for all requirements, the grades principally in demand are Prime Western and Special High Grade. There is reason to believe that consumers of these grades are now able to fill all requirements.

Bearing out this trend the report of the American Zinc Institute for July reports shipments of 51,909 net tons, which shows a gradual decrease since March's peak of 94,494 tons. Meanwhile, production has dropped off slightly to 65,806 tons from the March peak of 71,739 tons. Meanwhile, the zinc stockpile at the end of July has reached nearly 200,000 tons, which compares with a recent low of 168,539 in April. Coupled with decreasing shipments, the backlog of unfilled orders at the end of July has dropped to 16,656 tons.

Primary Metals

(Cents per lb., unless otherwise noted)

Aluminum, 99+%, del'd (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$3.00
Iridium, dollars per troy oz.	$120.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$145.00 to $149.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	$6.00 to 9.50
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52s, 24.2c.; 61S, 22.3c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness: 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ⅜ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 34c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NONFERROUS SCRAP METAL QUOTATIONS

†*(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.00
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S, 25S	4.50
turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 63S solids	7.50
turnings, dry basis	5.75

Plant scrap, mixed

Solids	4.00
Turnings, dry basis	2.75

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

Magnesium*

Segregated plant scrap

Pure solids and all other solids, exempt Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	25⅛
Electrodeposited	18⅞
Rolled, oval, straight	19⅛
Curved	20⅝
Brass, 80-20, frt. allowed	
Cast, oval, 15 in. or longer	23⅝
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 per cent plus, frt. allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 1-9 troy oz., per oz.	53*

Chemicals

(Cents per lb., f.o.b. shipping point)

Copper cyanide, 1-5 bbls.	34.00
Copper sulphate, 99.5, crystals, bbls.	7.75
Nickel salts, single, 425 lb. bbls., frt. allowed	13.50
Silver cyanide, 100 oz. lots	—.4179
Sodium cyanide, 96 per cent, domestic, 100 lb. drums	15.00
Zinc cyanide, 100 lb. drums	33.00
Zinc sulphate, 89 per cent, crystals, bbls., frt. allowed	6.35

*Price based on use of foreign silver.

SCRAP

. . . News and Market Activities

Tight Scrap Market Holds at Ceilings

New York

• • • The scrap market continues to hold firm at ceiling prices this week, scrap being in great demand by mills and foundries to maintain the barest minimum working inventories. There is some indication that consumers in a few market districts may be slightly apprehensive about their inventory position. But the supply position, in view of current inventories, is such as to prevent withdrawals from the market of many consumers. Dealers and brokers consider that the price of scrap under OPA controls is too low to permit hedging on purchase orders until there is a drastic drop in the ingot rate. Another factor which serves to limit the prospect of an immediate decline in scrap prices is the drying up of scrap supplies as a result of contract terminations, recently growing rapidly, but which should swell to a crescendo within the next few weeks. In shell production, particularly, one of the largest producers of turnings, cutbacks have severely affected the supply and continued this product at ceiling levels.

On the other hand, there is some evidence from the district reports that a certain amount of caution is now being exercised by consumers who in recent weeks have been ordering in a high, wide and handsome manner, any way in order to secure the delivery of scrap. Mills hazard no prospect of losing out in a bullish market by a certain amount of hesitation in buying, since prices are already at the maximum permitted by OPA. There is, however, some tendency to fail to be willing to pay the usual springboard for out-of-district transportation, although due to the tightness of scrap in the market there is little need to sell scrap out of the normal market area except in order to maintain cordial relations with customers.

•

PITTSBURGH — The scrap market here remains as firm as it has been for the past several weeks. Some sources indicate that machine shop turnings are still selling in the $14.50 to $15.00 range, but the weight of opinion is that prices are firm at $15.00 without springboard or commission. It appears that machine shop turnings orders for Sparrows Point, Md., have been diverted to Johnstown, Pa., which undoubtedly tends to weaken the Pittsburgh prices. War news has had no immediate effect upon the scrap market here, and it seems now unlikely that it will cause any undue fluctuations of prices or buying. Old contracts have been maintained, despite a tendency toward less new buying. While plate and bar production may decline, sheet and strip production will increase as soon as controls are eased, so that the total steel melt will not decline to any great extent. Inventories are not dangerously high at mills, and, as considerable alloy steelmaking capacity diverts to carbon steel, the market for carbon steel scrap will be improved. There will likely, however, be heavy surpluses of alloy scrap, as there have been in the past year, and these tonnages will not be assimilated very quickly.

•

CHICAGO—Prospective changes in the steel operating rate picture due to war contract cancellations had little immediate effect on the scrap market. New orders were noticeably absent with buyers sitting tight until an accurate appraisal could be made of future requirements. Heavy orders placed in the past month in anticipation of continued near-capacity operation and scarcity of scrap provided a basis for continuing operations for several weeks should the operating rate be unaffected, and would allow building up of depleted inventories should a temporary cutback in operations ensue. Few, if any, stop orders had been placed against shipments up to press time as a result of the war situation. Possibility of future reduction in demand was offset by the prospect of a sudden drying up of scrap sources due to war contract cutbacks. In the turnings classification particularly, where sheet production constituted an important source, possibility of temporary scarcity looms. Halt in buying activities had no immediate repercussions in prices, although it was conceded that springboards which consumers were willing to pay in this district might be cut. Current springboard levels are $1.50 on melting steel grades and about $1.00 on turnings.

•

PHILADELPHIA—Peace talk has definitely affected the scrap market here this week with brokers and consumers exercising extreme caution in their commitments. Small purchases have been made and several brokers feel that in a few days the market will return to normal since shipments during the past weeks have not been heavy. The old problems of freight cars and manpower continue to be the major causes of light shipments, as well as the drop in production scrap which is expected to be more sharply felt in the coming weeks. Prices are unchanged.

•

DETROIT—Scrap remains at ceiling prices here with shipments continuing in small volume and customers requesting delivery. The approach of victory has apparently made little difference in demand based on currently limited scrap production. Turnings also continue at ceilings.

•

BUFFALO—Swift changes in the war picture scarcely ruffled the surface of the scrap market during the past week. Dealers were bullish on the outlook for steelmaking grades. Confidence was based largely on the tight situation in heavy material, the low inventory of the leading consumer, and prospects for a quick shift to a heavy backlog of civilian business. While no new buying was reported in openhearth items, steel foundries and electric furnaces placed some orders in the midst of the first "peace" flurry.

•

CLEVELAND — War news has held the scrap market status quo in both the Cleveland and Youngstown districts, but has caused an undercurrent of speculation. Prices are holding firm in the districts, and mills are still going after scrap on outstanding orders. New orders, however, have slowed up a bit, mainly because mills are hesitant to make new commitments in the face of impending events. All grades are bringing ceiling prices and there are no evidences of any weakness in any rates. However, steel mill operations in the next few weeks could conceivably break the scrap prices, not only here but nationally.

•

BOSTON—With the army taking every gondola, flat and box car in sight to transport tanks, etc., from the Atlantic to the Pacific, yards have little opportunity to make shipments. Many a few did not get a single car the past week. The turn of events in the Pacific war, in the minds of the trade generally, has left the price question up in the air. Everybody is sitting on the sidelines waiting to see what happens.

•

NEW YORK—Scrap of all grades continues at ceilings in this market with supplies very tight and mills requesting early delivery on contracts. With the termination of the war at hand brokers recognize that their activities will depend on mill orders, which may in turn be determined by the degree of contract cutbacks and the speed with which reconversion moves can be completed. It is believed by the trade that the need for scrap during the reconversion period will be supplied as needed, if only from machinery and equipment rendered obsolescent during the war.

•

CINCINNATI—War end jitters are apparent in the market and dealers generally indicate that mills are all but out of the market during the present week. Brokers and dealers are sitting by to watch the trends of events and report some small sales to fill in inventory deficiencies. Prices, however, are unchanged following a modest increase of a week ago, to reflect strength in other districts.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4). Where ceiling prices are quoted they do not include brokerage fee or adjusted transportation charges. Asterisks indicate grades selling at ceilings.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts.	20.00*
Hvy. axle turn.	19.50*
Hvy. steel forge turn.	19.50*
Mach. shop turn.	15.00*
Short shov. turn.	17.00*
Mixed bor. and turn.	15.00*
Cast iron borings	16.00*
Hvy. break cast.	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup.	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls.	18.75*
Bundled mach. shop turn.	18.75*
Galv. bundles	16.75*
Mach. shop turn.	13.75*
Short shovel, turn.	15.75*
Cast iron borings	14.75*
Mix. borings & turn.	13.75*
Low phos. hvy. forge.	23.75*
Low phos. plates	21.25*
No. 1 RR. hvy. melt.	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Rails 3 ft. and under	22.25*
Locomotive tires, cut	22.75 to 23.25
Cut bolsters & side frames	20.25 to 21.25
Angles & splice bars	22.25*
Standard stl. car axles	25.00 to 25.50
No. 3 steel wheels	23.25*
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast	20.00*
No. 1 agricul. cast	20.00*
Hvy. breakable cast	16.50*
RR. grate bars	15.25*
Cast iron brake shoes	15.25*
Stove plate	19.00*
Clean auto cast	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	19.50*
Mach. shop turn.	$10.50 to 11.00
Shoveling turn.	12.50 to 13.00
Cast iron borings	11.50 to 12.00
Mixed bor. & turn.	11.50 to 12.00
Low phos. plate	22.00*
No. 1 cupola cast.	20.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Scrap rails	21.00*

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	12.05*
Machine shop turn.	10.05*
Mixed bor. & turn.	10.05*
Cl'n cast, chem. bor.	13.06 to 14.15*

Truck delivery to foundry

Machinery cast.	21.00 to 23.51*
Breakable cast	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	12.32*
Short shov. turn.	14.32*
Cast iron borings	13.32*
Mixed bor. & turn.	12.32*
Low phos. plate	19.32*
No. 1 cupola cast.	20.00*
Charging box cast.	19.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Automotive cast	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 2 bundles	18.75*
Mach. shop turn.	13.75*
Shoveling turn.	15.75*
Cast iron borings	13.50 to 14.00
Mixed bor. & turn.	13.75*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Cast, charging box	19.00*
Hvy. axle forge turn.	18.25*
Low phos. plate	21.25*
Low phos. punchings	21.25*
Billet crops	21.25*
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	10.25 to 10.75
Locomotive tires, uncut	18.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	22.00*
Steel car axles	23.50*
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	20.00*
No. 1 mach'ery cast	20.00*
Breakable cast	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	$9.50 to 10.00
Cast iron borings	10.50 to 11.00
Bar crops and plate	19.50*
Structural and plate	19.50*
No. 1 cast	20.00*
Stove plate	17.00
Steel axles	18.00*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	20.50*
Rails 3 ft. & under	21.00*
Cast iron carwheels	16.50 to 17.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop. turn.	15.00*
Short shovel. turn.	17.00*
Cast iron borings	16.00*

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33*
Mach. shop turn.	10.33*
Mixed bor. & turn.	10.33*
Shoveling turn.	12.33*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast	20.00*
Unstrip. motor blks.	17.50*
Cl'n chem. cast bor.	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	14.25*
Shoveling turn.	16.25*
Cast iron borings	16.25*
Mixed bor. & turn.	14.25*
No. 1 cupola cast	20.00*
Stove plate	19.00*
Low phos. plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	22.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs.	23.75*
RR. knuckles & coup.	23.75*
RR. malleable	22.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00*
No. 2 bundles	19.50*
Mach. shop turn.	14.50*
Short shovel.	16.50*
No. 1 busheling	19.50*
Steel axle turn.	19.00*
Low phos. billet and bloom crops	24.50*
Cast iron borings	15.50*
Mixed bor. & turn.	14.50*
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.25*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$16.50
No. 1 hvy. melting	16.50
No. 2 hvy. melting	15.00
No. 2 bales	$13.50 to 14.25
No. 3 bales	9.50 to 10.59
Mach. shop turn.	7.00
Elec. furn. 1 ft., und.	15.50 to 17.00
No. 1 cupola cast.	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to $15.50
No. 2 hvy. melting	13.50 to 14.50
No. 2 bales	12.50 to 13.50
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50
No. 1 cupola cast.	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$14.50
No. 1 hvy. melting	14.50*
No. 3 bundles	11.50
Elec. furn. 1 ft., und.	17.00
No. 1 cupola cast	20.00*

Comparison of Prices . .

Advances over past week in **Heavy Type**; declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.

Flat-Rolled Steel: (cents per pound)	Aug. 14, 1945	Aug. 7, 1945	July 10, 1945	Aug. 15, 1944
Hot-rolled sheets	2.20	2.20	2.20	2.10
Cold-rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.70	3.70	3.70	3.50
Hot-rolled strip	2.10	2.10	2.10	2.10
Cold-rolled strip	2.80	2.80	2.80	2.80
Plates	2.25	2.25	2.25	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (dollars per base box)				
Tinplate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tinplate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (cents per pound)				
Merchant bars	2.25	2.25	2.25	2.15
Cold-finished bars	2.75	2.75	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (cents per pound)				
Bright wire	2.75	2.75	2.75	2.60
Wire nails	2.90	2.90	2.90	2.55
Rails: (dollars per gross ton)				
Heavy rails	$43.00	$43.00	$43.00	$40.00
Light rails	45.00	45.00	45.00	40.00
Semifinished Steel: (dollars per gross ton)				
Rerolling billets	$36.00	$36.00	$36.00	$34.00
Sheet bars	36.00	36.00	36.00	34.00
Slabs, rerolling	36.00	36.00	36.00	34.00
Forging billets	42.00	42.00	42.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (cents per pound)				
Wire rods	2.15	2.15	2.15	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (per gross ton)	Aug. 14, 1945	Aug. 7, 1945	July 10, 1945	Aug. 15, 1944
No. 2, foundry, Phila.	$26.84	$26.84	$26.84	$25.84
No. 2, Valley furnace	25.00	25.00	25.00	24.00
No. 2, Southern, Cin'ti	26.11	26.11	26.11	25.11
No. 2, Birmingham	21.38	21.38	21.38	20.38
No. 2, foundry, Chicago†	25.00	25.00	25.00	24.00
Basic, del'd eastern Pa.	26.34	26.34	26.34	25.34
Basic, Valley furnace	24.50	24.50	24.50	23.50
Malleable, Chicago†	25.00	25.00	25.00	24.00
Malleable, Valley	25.00	25.00	25.00	24.00
L. S. charcoal, Chicago	42.34	42.34	42.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60¢ per ton.
‡ For carlots at seaboard.

Scrap: (per gross ton)				
Heavy melt'g steel, P'gh	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$7.50	$7.50	$7.50	$7.00
Foundry coke, prompt	9.00	9.00	9.00	8.25
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin, Straits, New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . .

Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943 issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Aug. 14, 1945	2.41571¢ a pound	$24.61 a gross ton	$19.17 a gross ton
One week ago	2.41571¢ a pound	$24.61 a gross ton	$19.17 a gross ton
One month ago	2.41571¢ a pound	$24.61 a gross ton	$19.17 a gross ton
One year ago	2.30837¢ a pound	$23.61 a gross ton	$19.17 a gross ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1945	2.41571¢ May 29	2.21189¢ Jan. 2	$24.61 Feb. 20	$23.61 Jan. 2	$19.17	$19.17
1944	2.30837¢ Sept. 5	2.21189¢ Oct. 5	$23.61	$23.61	19.17	$15.67 Oct. 24
1943	2.25513¢	2.25513¢	23.61	23.61	19.17	$19.17
1942	2.26190¢	2.26190¢	23.61	23.61	19.17	$19.17
1941	2.43078¢	2.43078¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 8
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 9
1935	2.07642¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr. 24	1.95757¢ Jan. 2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct. 3	1.75836¢ May 2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July 5	1,83901¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan. 13	1.86586¢ Dec. 29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1930	2.25488¢ Jan. 7	1.97319¢ Dec. 9	18.21 Jan. 7	15.90 Dec. 16	15.00 Feb. 18	11.25 Dec. 9
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 pct of the United States output. Index recapitulated in Aug. 28, 1941 issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

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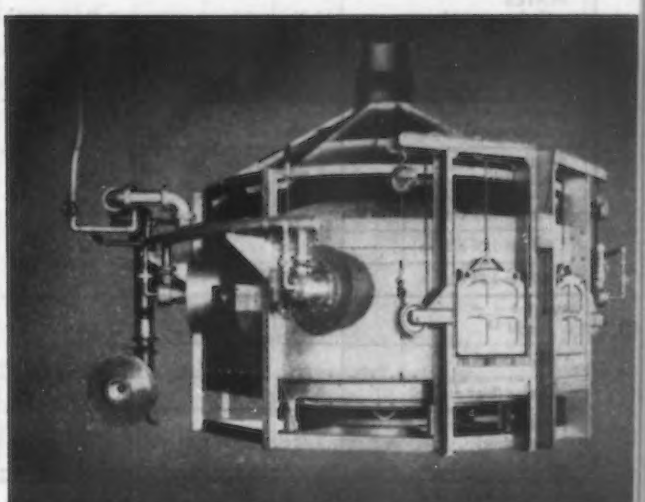

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Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per pound unless otherwise indicated. Extras apply. Delivered prices do not reflect 3 pct tax on freight. (1) Mill run sheet, 10¢ per 100 lb under base; primes, 25¢ above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb to fabricators. (8) Also shafting. For quantities of 20,000 to 39,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) This base price for annealed, bright finish wires, commercial spring wire. (13) Produced to dimensional tolerances in AISI Manual Sect. 6. For price exceptions to finished and semi-finished steels turn several pages.

Basing Points	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars [10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot-rolled	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.30¢	2.20¢		2.75¢	2.30¢	2.44¢	2.37¢
Cold-rolled [1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 gage)	3.70¢	3.70¢	3.70¢		3.70¢	3.70¢	3.70¢	3.70¢	3.80¢	3.70¢		4.25¢		3.94¢	3.87¢
Enameling (20 gage)	3.45¢	3.45¢	3.45¢	3.45¢			3.45¢		3.55¢	3.45¢		4.10¢	3.55¢	3.81¢	3.77¢
Long ternes [2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot-rolled [3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold-rolled [4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester=3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.58¢	
Commodity cold-rolled	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester=3.35¢)					3.65¢	3.31¢	
TINPLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
Electro, box 0.25 lb	$4.35	$4.35	$4.35												
Electro, box 0.50 lb	$4.50	$4.50	$4.50						$4.60						
Electro, box 0.75 lb	$4.65		$4.65						$4.75						
BLACKPLATE															
29 gage [5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[11]			3.37¢
TERNES, MFG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		(Duluth=2.35¢)			2.60¢	2.90¢	2.35¢	2.59¢	2.57¢
Rail steel [6]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢					2.60¢	2.90¢			
Reinforcing (billet) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢	2.39¢	
Reinforcing (rail) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢	2.25¢		2.47¢
Cold-finished [8]	2.75¢	2.75¢	2.75¢	2.75¢		2.75¢			(Detroit=2.80¢)		(Toledo=2.90¢)			3.09¢	3.07¢
Alloy, hot-rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton=2.70¢)					2.80¢		
Alloy, cold-drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES								(Coatesville and Claymont=2.25¢)							
Carbon steel [13]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		2.25¢	2.25¢			2.60¢	2.80¢	2.47¢	2.44¢	2.30¢
Floor plates	3.50¢	3.50¢									3.85¢	4.15¢		3.86¢	3.83¢
Alloy	3.50¢	3.50¢			(Coatesville=3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem=2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 carbon	2.80¢			2.80¢			(Worcester=3.00¢)								
0.51 to 0.75 carbon	4.30¢			4.30¢			(Worcester=4.50¢)								
0.76 to 1.00 carbon	6.15¢			6.15¢			(Worcester=6.35¢)								
1.01 to 1.25 carbon	8.35¢			8.35¢			(Worcester=8.55¢)								
WIRE [9]															
Bright [12]	2.75¢	2.75¢		2.75¢	2.75¢		(Worcester=2.85¢)		(Duluth=2.80¢)			3.25¢			3.07¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire base														
Spring (high carbon)	3.35¢	3.35¢		3.35¢			(Worcester=3.45¢)					3.85¢			3.67¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

SEMIFINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3.00 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12.00 higher. Provo, $11.20 higher. Delivered prices do not reflect 3 pct tax on freight rates.

Per Gross Ton

Rerolling $36.00
Forging 42.00

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem, per gross ton $54.00

Price delivered Detroit $2.00 higher; East Michigan, $3.00 higher.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

Per Gross Ton

Openhearth or bessemer $36.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.15c.
Worcester, Mass.	2.25c.
Birmingham	2.15c.
San Francisco	2.65c.
Galveston	2.40c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$43.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$45.00
Light rails (from rail steel)	44.00
	Base per Lb.
Cut spikes	3.35c.
Screw spikes	5.40c.
Tie plate, steel	2.30c.
Tie plates, Pacific Coast	2.45c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	*Pacific Coast Basing Points†*
	Base per Keg	
Standard wire nails	$2.90	$3.40
Coated nails	2.90	3.40
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	67	85
Fence posts, carloads	69	86
Single loop bale ties	66	91
Galvanized barbed wire**	72	82
Twisted barbless wire	72	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	$3.518	$4.872[5]	$4.768a	$3.922	$4.772	$3.605	$3.666	$3.822	$4.172	$5.816	$6.866	$7.072	$8.172
New York	3.59	4.613[2]	5.110	3.974[6]	4.772	3.768	3.758	3.853	4.203	5.858	6.908	7.103	8.203
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.244	6.012	7.062	7.194	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.152	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.265	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.85[17]	3.55	3.55	3.50	3.85	5.80	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.987	5.837	6.887	6.887	7.987
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.85	5.806	6.856	6.65	7.75
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.85	5.60	6.65	6.65	7.75
Detroit	3.45	4.50	5.004	3.70	4.859[17]	3.609	3.661	3.45	3.90	5.93	6.98	6.959	8.059
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.551	3.691	3.611	4.111	5.95	7.00	7.011	8.261
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.131	5.981	7.031	7.031	8.131
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.85	5.60	6.65	6.65	7.90
St. Paul	3.50	4.46	5.257[4]	3.86	5.102[17]	3.8113	3.8113	3.7813	3.461	5.94	6.99	7.361	8.461
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.543	....	....	....	....
Indianapolis	3.518	4.568	4.548	3.768	4.741	3.63	3.63	3.58	4.00	5.93	6.98	6.98	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.53	....	....	....	....
Memphis	3.965[7]	4.66	5.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	5.079	5.358	4.308	....	4.158	4.158*	4.108*	4.729	....	....	....	....
Houston	3.763	5.573	6.3131	4.313	....	4.25	4.25	3.75	6.473[2]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.203	6.104	4.95	5.61315	4.95	4.85	4.40	5.683	8.204	9.404	9.304	10.454
San Francisco	4.5514	7.304	6.354	4.5014	7.33317	4.6514	4.3514	4.1514	5.433	8.304	9.404	9.404	10.454
Seattle	4.6512	7.054	5.954	4.2512	....	4.7512	4.4512	4.3512	5.883	....	9.404	....	....
Portland	4.6511	6.604	5.754	4.7511	....	4.8511	4.4511	4.4511	5.633	8.304	9.404	8.304	9.404
Salt Lake City	4.53017	....	6.1713	5.5317	....	4.9817	4.9817	4.8817	6.00	....	....	....	....

National Emergency Steels

MILL EXTRAS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9427	0.75¢	$15.00	$1.25	$25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8627	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8637	0.65	13.00	1.15	23.00					
NE 8640	0.65	13.00	1.15	23.00					
NE 8642	0.65	13.00	1.15	23.00	NE 9722	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
					NE 9742	0.65	13.00	1.15	23.00
					NE 9745	0.65	13.00	1.15	23.00
NE 8712	0.70	14.00	1.20	24.00	NE 9747	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8722	0.70	14.00	1.20	24.00					
NE 8725	0.70	14.00	1.20	24.00					
NE 8727	0.70	14.00	1.20	24.00	NE 9830	1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9836	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8747	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8750	0.70	14.00	1.20	24.00					
					NE 9912	1.20	24.00	1.55	31.00
NE 9415	0.75	15.00	1.25	25.00	NE 9915	1.20	24.00	1.55	31.00
NE 9417	0.75	15.00	1.25	25.00	NE 9917	1.20	24.00	1.55	31.00
NE 9420	0.75	15.00	1.25	25.00	NE 9920	1.20	24.00	1.55	31.00
NE 9422	0.75	15.00	1.25	25.00	NE 9922	1.20	24.00	1.55	31.00
NE 9425	0.75	15.00	1.25	25.00	NE 9925	1.20	24.00	1.65	31.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under with a maximum individual piece weight of 7000 lb. irrespective of size. Note 2: For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, AISI Steel Products Manual. Note 3: When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. Note 4: The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

WELDED PIPE AND TUBING

Base discounts, f.o.b. Pittsburgh district and Lorain, Ohio, mills

(F.o.b. Pittsburgh only on wrought pipe) base price—$200.00 per net ton

	Black	Galv.
Steel (buttweld)		
½-in.	63½	51
¾-in.	66½	55
1-in. to 3-in.	68½	57½
Wrought Iron (buttweld)		
½-in.	24	3½
¾-in.	30	10
1-in. and 1¼-in.	34	16
1½-in.	38	18½
2-in.	37½	18
Steel (lapweld)		
2-in.	61	49½
2½-in. and 3-in.	64	52½
3½-in. to 6-in.	66	54½
Wrought Iron (lapweld)		
2-in.	30½	12
2½-in. to 3½-in.	31½	14½
4-in.	33½	18
4½-in. to 8-in.	32½	17
Steel (butt, extra strong, plain ends)		
½-in.	61½	50½
¾-in.	65½	54½
1-in. to 3-in.	67	57
Wrought Iron (same as above)		
½-in.	25	6
¾-in.	31	12
1-in. to 2-in.	38	19½
Steel (lap, extra strong, plain ends)		
2-in.	59	48½
2½-in. and 3-in.	63	52½
3½-in. to 6-in.	66½	56
Wrought Iron (same as above)		
2-in.	33½	15½
2½-in. to 4-in.	39	22½
4½-in. to 6-in.	37½	21

On buttweld and lapweld steel pipe jobbers are granted a discount of 5 pct. On l.c.l. shipments prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lapweld and one point lower discount, or $2 a ton higher on all buttweld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect 3 pct tax on freight rates.

BOILER TUBES

Seamless steel and lapweld commercial boiler tubes and locomotive tubes, Minimum wall. Net base prices per 100 ft f.o.b. Pittsburgh, in carload lots.

	Seamless Cold-Drawn	*Seamless Hot-Rolled*	*Lapweld, Hot-Rolled*
2 in. O.D. 13 B.W.G.	15.03	13.04	12.38
2½ in. O.D. 12 B.W.G.	20.21	17.54	16.58
3 in. O.D. 12 B.W.G.	22.48	19.50	18.35
3½ in. O.D. 11 B.W.G.	28.37	24.62	23.15
4 in. O.D. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb or ft and over	Base
30,000 lb or ft to 39,999 lb or ft	5 pct
20,000 lb or ft to 29,999 lb or ft	10 pct
10,000 lb or ft to 19,999 lb or ft	20 pct
5,000 lb or ft to 9,999 lb or ft	30 pct
2,000 lb or ft or 4,999 lb or ft	45 pct
Under 2,000 lb or ft	65 pct

PRICES

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$68.55
First quality, Pa., Md., Ky., Mo., Ill.	54.45
First quality, New Jersey	59.45
Sec. quality, Pa., Md. Ky., Mo., Ill.	49.40
Sec. quality, New Jersey	54.15
No. 1 Ohio	45.75
Ground fire clay, net ton	8.05

Silica Brick

Pennsylvania and Birmingham	$54.45
Chicago District	62.45
Silica cement, net ton (Eastern)	9.55

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.43
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

EXCEPTIONS TO RPS 6

Ingots, carbon, rerolling—Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10. Granite City Steel, $39.45.

Ingots, carbon, forging—Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, alloy—C/l delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Slabs, per gross ton—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50; Kaiser Co., (rerolling) $58.64, (forging) $64.64, f.o.b. Los Angeles.

Blooms, per gross ton—Phoenix Iron Co. (rerolling) $41; (forging) $47; Pgh. Steel Co. (rerolling) $38.25, (forging) $44.25; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth; Kaiser Co. (rerolling) $58.64, (forging) $64.64 (shell steel) $74.64 f.o.b. Los Angeles.

Sheet Bar, per gross ton—Empire Sheet & Tinplate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging, per gross ton—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto, Ohio; Phoenix Iron Co. $47 mill; Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50; Kaiser Co. $64.64, (shell steel) $74.64, f.o.b. Los Angeles.

PRICES

Billets, Rerolling, per gross ton—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.60 Birmingham; Ford Motor Co. $34 Dearborn, Mich.; Geneva Steel Co. $58.64 f.o.b. Pacific Coast; Pgh. Steel Co. $43.50; Kaiser Co. $58.64 f.o.b. Los Angeles.

Structural Shapes—Phoenix Iron Co. 2.35c. basing pts. (export) 2.50c. Phoenixville; Knoxville Iron Co. 2.30c. basing points; Kaiser Co. 3.20c. f.o.b. Los Angeles.

Rails, per gross ton—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron, $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. 2.85c. produced on DPC eqpt., 2.35c. otherwise; Knoxville Iron Co. 2.25c. basing pts.; Kaiser Co. and Geneva Steel Co. 3.20c. Pacific Ports; Central Iron and Steel Co. 2.50c. basing points; Granite City Steel Co. 2.35c. Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, 2.85c. mill; Eckels-Nye Steel Corp. 2.50c. basing pts. (rail steel) 2.40c.; Phoenix Iron Co. 2.40c. basing pts.; Sweet Steel Co. (rail steel) 2.33c. mill; Joslyn Mfg. & Supply Co., 2.35c. Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar), 2.35c. Chicago; Knoxville Iron Co., 2.30c. basing pts.; Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.ob Madison, Ill.; Milton Mfg. Co., 2.75c. f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel, Benwood, 2.05c.

Reinforcing Bars—W. Ames & Co., 10 tons and over, 2.85c. mill; Sweet Steel Co. (rail steel), 2.33c. mill; Columbia Steel Co., 2.50c. Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants, f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass., f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co., for delivery except Texas and Okla., Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co., shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co., 2.30c. Chicago; Knoxville Iron Co., 2.25c. basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel, 2.25c. Parkersburg. Granite City Steel 2.45c.

Galvanized Sheets—Andrews Steel Co. 3.75c. basing pts.; Parkersburg Iron & Steel Co., 3.85c. Parkersburg; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is 2.45c. per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Wire Products—Pittsburgh Steel Co., f.o.b. Pittsburgh, per 100 lb., rods, No. 5 to 9/32 in., 2.20c.; rods, heavier than 9/32, 2.35c.; bright wire, 2.725c.; bright nails, 2.90c.; lead and furnace annealed wire, 2.35c.; pot annealed wire, 2.85c.; galvanized barbed wire, 3.90c.; plain staples, 2.55c.; galvanized staples, 2.65c.; bright spring wire, 3.30c.; galvanized spring wire, 3.45c.

BASING POINT* BASE PRICES						DELIVERED PRICES† (BASE GRADES)						
Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.	Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	$25.50	$26.00	$26.50	$27.00	.....	Boston	Everett	$ .50	$26.00	$26.50	$27.00	$27.50	.....
Birdsboro	25.50	26.00	26.50	27.00	$30.50	Boston	Birdsboro-Steelton	4.02	.....	.....	.....	.....	$34.52
Birmingham	20.00	21.38	.....	26.00	.....	Brooklyn	Bethlehem	2.50	26.00	26.50	29.00	29.50	.....
Buffalo	24.00	25.00	25.50	26.00	30.50	Brooklyn	Birdsboro	2.92	.....	.....	.....	.....	33.42
Chicago	24.50	25.00	25.00	25.50	.....	Canton	Cleveland	1.39	25.89	26.39	26.39	26.89	.....
Cleveland	24.50	25.00	25.00	25.50	.....	Canton	Buffalo	3.19	.....	.....	.....	.....	33.89
Detroit	24.50	25.00	25.00	25.50	.....	Cincinnati	Birmingham	4.06	24.06	25.44	.....	.....	.....
Duluth	25.00	25.50	25.50	26.00	.....	Cincinnati	Hamilton	1.11	.....	.....	26.11	.....	.....
Erie	24.50	25.00	25.50	26.00	.....	Cincinnati	Buffalo	4.40	.....	.....	.....	.....	34.90
Everett	25.50	26.00	26.50	27.00	.....	Jersey City	Bethlehem	1.53	27.03	27.53	27.03	28.53	.....
Granite City	24.50	25.00	25.00	25.50	.....	Jersey City	Birdsboro	1.94	.....	.....	.....	.....	32.44
Hamilton	24.50	25.00	25.00	.....	.....	Los Angeles	Provo	4.95	27.45	27.95	.....	.....	.....
Neville Island	24.50	25.00	25.00	25.50	.....	Los Angeles	Buffalo	15.41	.....	.....	.....	.....	45.91
Provo	22.50	23.00	.....	.....	.....	Mansfield	Cleveland & Toledo	1.94	26.44	26.94	26.94	27.44	.....
Sharpsville[1]	24.50	25.00	25.00	25.50	.....	Mansfield	Buffalo	3.36	.....	.....	.....	.....	33.86
Sparrows Point	25.50	26.00	.....	.....	.....	Philadelphia	Swedeland	.84	26.34	26.84	27.34	27.84	.....
Steelton	25.50	.....	.....	.....	30.50	Philadelphia	Birdsboro	1.24	.....	.....	.....	.....	31.74
Swedeland	25.50	26.00	26.50	27.00	.....	San Francisco	Provo	4.95	27.45	27.95	.....	.....	.....
Toledo	24.50	25.00	25.00	25.50	.....	San Francisco	Buffalo	15.41	.....	.....	.....	.....	45.91
Youngstown	24.50	25.00	25.00	25.50	.....	Seattle	Provo	4.95	27.45	27.95	.....	.....	.....
						Seattle	Buffalo	15.41	.....	.....	.....	.....	45.91
						St. Louis	Granite City	.50	25.00	25.50	25.50	26.00	.....
						St. Louis	Buffalo	7.07	.....	.....	.....	.....	37.57

* Maximum per gross ton, established by OPA February 14, 1945. † Prices do not reflect 3 per cent tax on freight.

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10, April 11, 1945, retroactive to March 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 per cent silicon covered by RPS 10 as amended Feb. 14, 1945. Silvery iron, silicon 6.00 to 6.50 per cent, C/L per G.T., f.o.b. Jackon, Ohio—$30.50; f.o.b. Buffalo—$31.75. Add $1.00 per ton for each additional 0.50% Si. Add 50c. per ton for each 0.50% Mn over 1.00%. Add $1.00 per ton for 0.75% or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, ¢ per lb, ton lots.

Copper, electrolytic, 150 and 200 mesh	21½¢ to 23½¢
Copper, reduced, 150 and 200 mesh	20½¢ to 25½¢
Iron, commercial, 100 and 200 mesh 96 + % Fe	12½¢ to 15¢
Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots	4¢
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63¢
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33¢
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42¢
Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90¢
Aluminum, 100 and 200 mesh	*25¢
Antimony, 100 mesh	30¢
Cadmium, 100 mesh	$1.40
Chromium, 100 mesh and finer	$1.25
Lead, 100, 200 & 300 mesh	11½ to 15¢
Manganese	65¢
Nickel, 150 mesh	51½¢
Solder powder, 100 mesh	8½¢ plus metal
Tin, 100 mesh	58¾¢
Tungsten metal powder, 98%-99%, any quantity, per lb	$2.60
Molybdenum powder, 99%, in 200-lb kegs, f.o.b. York, Pa., per lb	$2.60
Under 100 lb	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.50*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	9.00
Foundry, By-Product	
Chicago, del'd	13.75
Chicago, f.o.b.	13.00
New England, del'd	14.65
Kearny, N. J., f.o.b.	13.05
Philadelphia, del'd	13.23
Buffalo, del'd	13.40
Portsmouth, Ohio, f.o.b.	11.50
Painesville, Ohio, f.o.b.	12.15
Erie, del'd	13.15
Cleveland, del'd	13.20
Cincinnati, del'd	13.25
St. Louis, del'd	14.25
Birmingham, del'd	11.90

*Hand drawn ovens using trucked coal permitted to charge $2.00 per ton plus transportation charges.

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	62½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

⅛ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	**U.S.S.**	**S.A.E.**
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
⅝ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.10c.
Armature	3.65c.
Electrical	4.15c.
Motor	5.05c.
Dynamo	5.75c.
Transformer 72	6.25c.
Transformer 65	7.25c.
Transformer 58	7.75c.
Transformer 52	8.55c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 3c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55c.
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

Silvery Iron, Silicon 14.01 to 14.50 per cent, $45.50 per G. T. f.o.b. Jackson, Ohio. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe..	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe..	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.30c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% *Cr.* 2% *max. Si*)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10%	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

FERROALLOY PRICES

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Bulk	Ton Lots	Less Ton
0.10% max. C, 1 or 2% max. Si..	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si..	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si..	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si..	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si..	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk..	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots..	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk..	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots..	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots.	17.00c.	17.35c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots..	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot ..... 45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.229
Less ton lots..	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.89	$1.903	$1.935
Less ton lots..	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more ...	$1.90	$1.9125	$1.9445
Ton lots	2.00	2.09125	2.0445
Less ton lots..	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa. York, Pa., per lb. contained tungsten, 10,000 lb. or more.... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.

Open hearth	$2.70
Crucible	$2.80
Primos	$2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal..... $1.50

Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5..... $1.10

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)

Carload lots	25c.
2000 lb. to carload.....	26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)

Carload lots	58c.
2000 lb. to carload.....	59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis

No. 1	87.5c.
No. 6	60c.
No. 79	45c.

Bortram, f.o.b. Niagara Falls

Ton lots, per lb.....	45c.
Less ton lots, per lb.....	50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.

2000 lb. lots	$2.25
Under 2000 lb. lots.....	$2.30

Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
Less ton lots..... $1.25

Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per lb. contained titanium $1.35
Less ton lots..... $1.40

High-carbon ferrotitanium, 15%-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y. freight allowed East of Mississippi River, north of Baltimore and St. Louis, per carload.....$142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton..... 58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo. ..... 80c.

Molybdenum oxide briquets, 48-52% Mo. f.ob. Langeloth, Pa. per lb. contained Mo..... 80c.

Molybdenum oxide, in cans, f.o.b Langeloth and Washington, Pa. per lb. contained Mo..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy
Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.

Car lots	8.00c.
Ton lots	8.75c.
Less ton lots	9.25c.

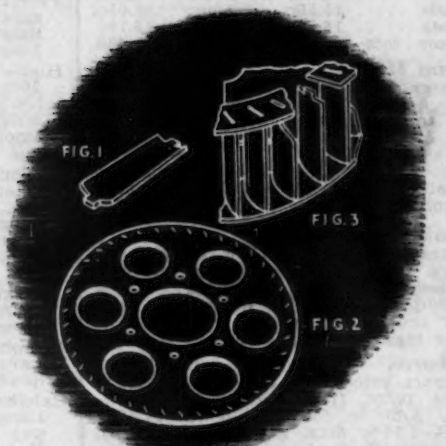
80 JOINTS COPPER BRAZED AT ONE TIME! BY SALKOVER

WHEN assembled by another method, this cooling fan for small high speed gasoline engines frequently fell apart after brief service periods. Severe torsional vibration added to localized cold working fabrication stresses resulted in almost immediate fatigue failure. However, when these fans were copper brazed, cold working stresses were relieved, joint strength was decidedly higher than previously, and fatigue failures were eliminated completely. Despite highest operating speeds, there were no structural breakdowns.

Furthermore, copper brazing offers the designing engineer another practical, proven method of substantial cost saving without quality reduction. Break down into their simple elements your complicated parts machined from bar stock, castings or forgings. Produce these elements on punch press and screw machine. Joined together by copper brazing, your assemblies will have the added advantage of joint strength equal to that of the parent metal.

Our engineers will gladly design your assemblies for copper brazing—have all your work brazed in a nearby Salkover plant. Write for further details.

Send us blueprints and samples for analysis and quotation.



40 vanes (fig. 1) are slotted into a stamped steel spider (fig. 2) and a steel ring (see front of fan at top). Figure 3 shows details of this assembly. Another benefit of copper brazing—when parts emerge from the controlled atmosphere furnace they are clean and bright eliminating the need for pickling before plating or other finishing operations.

TWO PLANTS
4211 W. Lake Street, Chicago 24, Ill.
34-18 Borden Ave., Long Island City 1, N. Y.

Salkover METAL PROCESSING

COMMERCIAL ELECTRIC FURNACE COPPER BRAZING · BRIGHT ANNEALING · SILVER SOLDERING